What's coming?
What's going?
What's staying?

The impact of the pandemic

changes

What's driving the process industry

2021

Endress+Hauser

The coronavirus pandemic has burst the best-laid plans and bold dreams as easily as shimmering soap bubbles, showing us how fleeting our existence is, and the preciousness of our health. At the same time it is creating a sense of solidarity and unleashing creative forces. The crisis is constantly shape-shifting, depending on your perspective.

What does Covid-19 mean for the process industry?

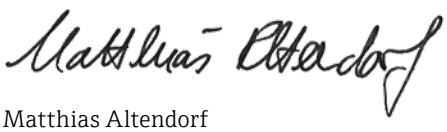
Do you still recall the moment you first heard about the coronavirus? The initial awareness that something life-changing was afoot? I was travelling on business in Asia at the time, in early 2020, and suddenly found myself at the almost deserted Taoyuan International Airport. All at once, the crisis was plain to see.

Since then, the pandemic has turned our lives upside down, challenging us anew each and every day, both privately and professionally. This crisis presents special challenges for the process industry. How can we protect people, keep the business running and continue to provide our customers with excellent support all at the same time? As well as managing the crisis operationally, how do we set the right strategic course?

Under the title "What's coming? What's going? What's staying?", 'changes' magazine is pursuing these questions and seeking answers to what this means for companies in the process industry. We discuss what the pandemic means for the major tasks facing humanity. And we search for the opportunities that are also available to us in this situation.

Although much remains open at the moment, there is nevertheless a wealth of encouraging findings and developments. There is no question that the coronavirus pandemic is impacting the process industry. And this is exactly the issue that "changes" is addressing. We hope our magazine appeals to you, and that it radiates the confidence all of us need to work together for a better future.

Here's wishing you a stimulating reading experience!



Matthias Altendorf
CEO of the Endress+Hauser Group

"The pandemic presents special challenges for the process industry. Apart from managing the crisis operationally, we also have to set the right strategic course."

Turning point

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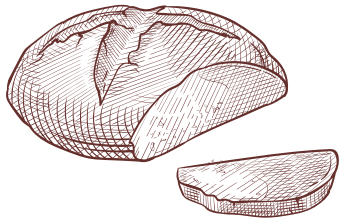
Destination unknown

The pandemic has a thousand faces. It changes how we meet each other, how we travel, how we learn and how we dress. Things that often lead to problems sometimes have positive aspects. Time to take stock and ask: what lies ahead, what will disappear and what will stay?

Text: Alexandra Schröder, Cornelia Theisen, Florian Lehmann, Robert Habi, Roman Scherer
Photography and illustration: Getty Images, Shutterstock, 3st

Last but not yeast



At the beginning of the pandemic, yeast and flour were often in short supply: many people were using the lockdown to bake their own bread. The trend for homemade sourdough and experiments with banana bread continue. Whether the popularity of homemade bread stems from an elementary need for self-sufficiency during a crisis, or from the calming effect of kneading dough by hand, is something that science still needs to find out.

Prognosis: will stay for some time. The world's oldest sourdough starter, originating in Canada, is claimed to be 120 years old. Perhaps a 'coronadough' will break that record one day.

Eric Klinenberg, Professor for Sociology and Director of the Institute for Public Knowledge, New York University:

"For me it's more about physical distancing than social distancing. Social distancing sounds as if the only way to overcome this crisis is if we turn our backs on one another. The only way we're going to be able to take care of and protect the people who are truly in need is if we build up or draw on whatever stock of social solidarity we still have."

Prognosis: will stay, considering that we're all in the same boat.

Not without my protective mask

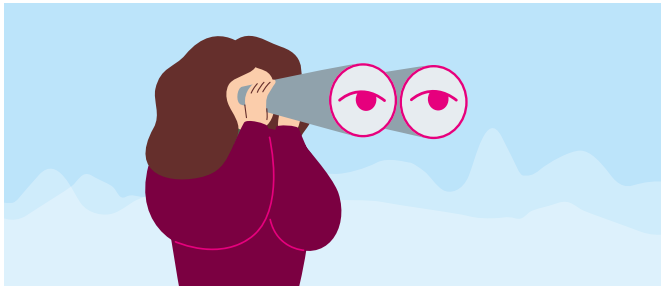
In Asia, even before the pandemic arrived protective masks were a commonplace sight on streets where massive crowds make it impossible to maintain distance from one another. In the West, we're amazed at how quickly everyone has become accustomed to wearing them. Much like it's a pretty good idea to wash your hands even without SARS-CoV-2, protective masks can prevent the transmission of everyday colds and the winter flu. And besides, they keep noses warm when temperatures drop below freezing.

Prognosis: will stay around for a while and is bearable when it serves our health.

Everything by video

Dating, cooking classes, after-work happy hours – not to mention work meetings. During the pandemic, many interpersonal relationships are playing out on people's computer screens. There are a lot of advantages to be discovered, especially when it involves flexible work environments or class instruction. The limits of virtual encounters are nonetheless becoming highly evident. Compared to the real world, the cognitive burden is demonstrably higher, plus many people miss the physical contact of real get-togethers.

Prognosis: will stay to some extent, and that's a good thing. Especially at work or school, this flexibility brings added value. But when it comes to raising one's glass or a rendezvous, up-close and live is better.



Home turf

Vacationers were forced to rethink their plans during the pandemic. Instead of jetting off to distant places, travel took place – if at all – in one's own country. That meant many people learned to appreciate the benefits of shorter trips. Vacations close to home have the potential to become a trend even beyond the pandemic, a prognosis confirmed by a current survey in Germany, the US and China.

Prognosis: will gather momentum, with a positive side-effect: fewer flights and ocean cruises are good for the climate.

My home is my classroom

What is already commonplace in some countries like Denmark is a monumental task for children, teachers and parents in other parts of the world: digital instruction at home. According to the World Economic Forum in Geneva, 'home schooling' will likely have a long-term impact on education. What that translates to, apart from equipping schools and students with technology, is that it will be particularly important to help teachers and educators get in shape for remote instruction and continue to provide all children access to educational opportunities. This is where government policies, above all, are called upon.

Prognosis: will stay and remain a challenge for all involved – but also an opportunity.

DIY therapy

Hammers, saws, paintbrushes and rollers: more and more people are diving into creative do-it-yourself projects at home and sinking money into their own four walls. In line with the motto "if the pandemic is going to keep us locked up, then it's going to be inside a beautiful home", people are renovating, decorating and fixing-up like never before. In Germany the do-it-yourself industry is recording growth of nearly 15 percent, while shares in US home improvement retailers like Home Depot and Lowe's have risen by around one-third. In the UK, online purchases of construction and hobby products increased by 50 percent.

Prognosis: will eventually subside. At some point, every room will have a fresh coat of paint.

Advice from the cycologist

Thinking about buying a bicycle in Covid times? Great idea, but next to impossible. On the back of huge demand, the market for two-wheelers has been cleaned out in many countries. In the US, for instance, as many bicycles were sold in April and May 2020 as during the 70s oil crisis. In Europe many people are using bicycles for commuting to work in order to avoid public transportation or to stay active after work. A positive side-effect is that many cities like Brussels, Barcelona and Milan have built new cycle paths on short notice or declared entire downtown areas vehicle-free zones.

Prognosis: will stay because cycling is not only healthy but benefits the environment and frees up space in cities.

Dress code? What dress code?

With the necktie already in retreat pre-pandemic, the year 2020 has dealt a body blow to sartorial graces. Loungewear is on the rise. In the home office, the desire to dress nattily is disappearing. Data analysis company Reply reports that shortly after the pandemic began, fashion interest among the British, Germans, French, Italians and Spaniards was 23 percent down on the previous year. Similar reports have circulated in US and South African media. And in China, one of the most frequently searched hashtags during the Chinese New Year was #OnePajamaForTheWholeDay. You can easily imagine where this is heading.

Prognosis: will stay with us because we won't be able to repel the virus as fast as our eyes will grow accustomed to the new leisure look.

Turning point

Like a catalyst, the coronavirus pandemic has accelerated and reinforced developments in the process industry. Digitalization is leaping forward and economic balances are shifting. And once the immediate crisis has been overcome, long-term challenges will push their way back on to the agenda.

Text: Johannes Winterhagen
Illustration: Aleksandar Savić

Arthur Zhang vividly recalls the moment when he realized the virus would change his business. It was 22 January 2020, five days before the Chinese New Year festivities, when the doctor responsible for his residential district called him. “Is it correct that you returned from Wuhan the day before yesterday?” Arthur Zhang did indeed travel to Wuhan for a customer meeting – and thus received an urgent recommendation to stay at home for two weeks. He used the time to reorganize his company from the confines of his apartment.

Arthur Zhang is managing director of the Endress+Hauser sales center in China, where he is responsible for the Group’s single largest market. After the outbreak, he instructed around 70 percent of more than 450 employees to work from home, then organized medical protective masks for the remaining people. What followed was a demanding quarter, not least in economic terms.

A BOOST FOR DIGITALIZATION

Just under a year later, China’s economy is booming again. Growth would have been higher still were it not for a shortage of shipping containers that restricted export capacity. Does that mean everything is back to how it was before the pandemic? Arthur Zhang, who has worked in the process industry for more than three decades, begs to differ. “In the new normal, we’re still living with a high awareness of the risks.” Although meetings with customers are being held again, and ever more employees are returning to the office, digital meetings are now part of the daily routine.

The digitalization boost has touched all areas, including industrial production. “The pandemic made the value of smart factories very clear,” reports Arthur Zhang. Many customers are investing in automation, IT and communication technologies. “In many cases, the sensors are initially being deployed to remotely monitor process conditions,” says the managing director. “Customers then realize that the data this makes available can be used to positive effect on process safety and product quality.”

"The pandemic has magnified the demand for further integration in the Internet of Things, digitalization of data processing and cybersecurity."

Robert Helminiak,
Vice President, Society of Chemical Manufacturers and Affiliates

94 %

of all companies suffered supply chain disruptions in 2020, according to Euler Hermes.

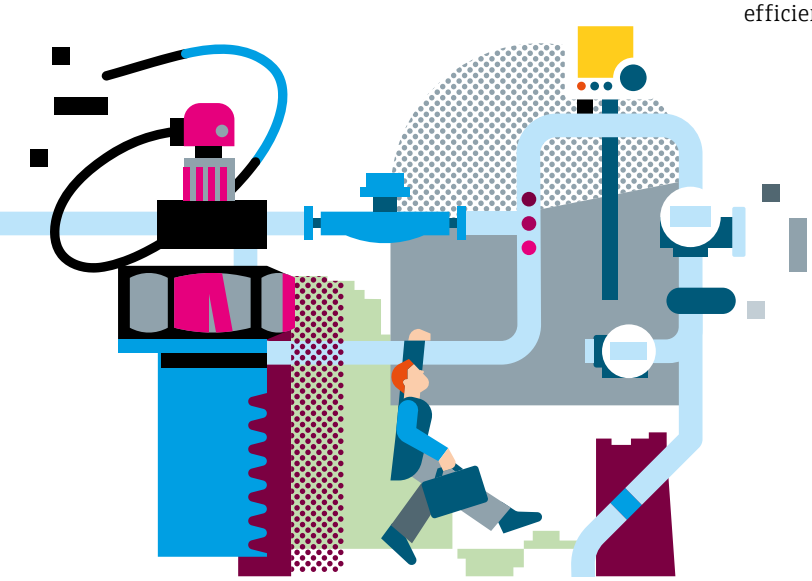
Robert Helminiak from the Society of Chemical Manufacturers and Affiliates (SOCMA) in the United States confirms this assessment. “The pandemic has magnified the demand for further integration of components and plants in the Internet of Things, digitalization of data processing and cybersecurity,” says the vice president, whose association represents more than 200 companies in the specialty chemicals industry. However, there is still no agreement on how far digitalization needs to go and how fast it should happen.

OLD CHALLENGES, NEW SOLUTIONS

Digitalization of the process industry could also help in other areas, for example in coping with demographic change. “Many of the experienced chemists and process engineers, who can monitor the plant almost by sight, will be heading into retirement within the next few years,” says Thomas Hucht, managing director of engineering services company plantIng, a subsidiary of the Able Group. “Given that there is a lack of young talent, it would be smart to digitally model the experience these experts have acquired.”

Generally speaking, Covid-19 has had little effect on the significance of global megatrends. At best, the crisis has led to increased emphasis or provided additional momentum to these developments. Although worldwide CO_2 emissions have fallen seven percent in the past year, this will offer mankind no more than a brief respite in the battle against climate change. For chemicals and other segments of the process industry, in 2020 the global decisions on climate protection were at least as consequential as the pandemic. While the economic repercussions of the pandemic are mostly short term, CO_2 neutrality often means a complete retrofit of existing production processes.

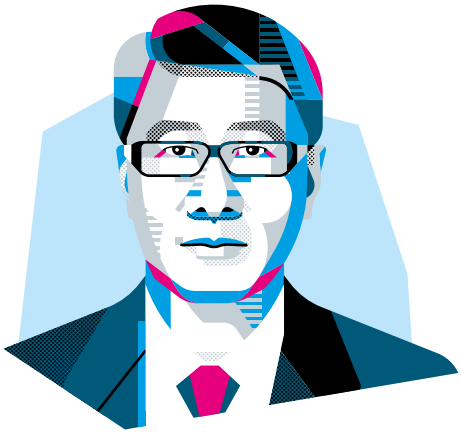
“The substitution of hydrocarbons, as well as the introduction of a circular economy, are the greatest challenges of the future,” emphasizes Professor Kurt Wagemann, managing director at Dechema, a Germany-based expert network in the area of chemical technology and biotechnology. The European Union believes the key to climate-neutral industrial production lies in green hydrogen, strategically setting a corresponding course in 2020. The plan now is not only to steer investment programs toward a long-term restructuring of the energy industry but to provide a boost to energy efficiency and advance electromobility on the continent.



NEW GREEN DEAL

It at least appears that the major economic blocs are once again pulling together in terms of climate protection. While Europe tightened its climate goals for the year 2030, US President Joe Biden, on his first day in office, signed an executive order to have the country rejoin the Paris Agreement, and Chinese President Xi Jinping announced that his country wants to be climate-neutral by the year 2060. A harbinger of closer cooperation in tackling the major tasks of the future?

“The concerted response to Covid-19 offers renewed hope that international science, technology and innovation cooperation can help provide solutions to other global challenges,” writes the Organization for Economic Cooperation and Development (OECD) in a report full of optimism. In record time, researchers developed vaccines effective against the coronavirus. And



"Globalization will continue to spread; there is no turning back. And China will be part of the system."

Arthur Zhang,
Managing Director, Endress+Hauser China

working at great speed, pharmaceutical companies vastly expanded their capacity to ensure safe production of the vaccines. Industry is not part of the problem, but the solution.

Triggered by temporary supply bottlenecks during the pandemic, complaints about the global flow of goods and value chains are being voiced in Europe and the US. According to a survey by Euler Hermes, 94 percent of all companies suffered supply chain disruptions last year. Other studies claim figures between 56 and 80 percent. The reasons vary, from rapidly rising demand and production stoppages, to closed national borders. But one thing seems clear: our highly interconnected global economy showed how vulnerable it is.

GLOBAL DEPENDENCIES

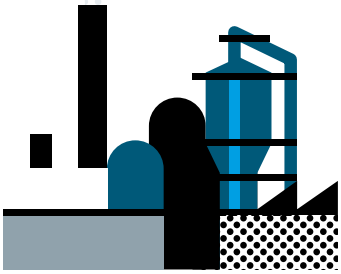
Will globalization now be rolled back? Will value creation become more regionalized? "With the pandemic fracturing the global supply chain, companies can no longer afford to rely on a single provider of an input," emphasizes Robert Helminiak from SOCMA. On the other hand, the bottlenecks could have created new opportunities as well. "Pioneering new products that are integral in making our lives safer, healthier and more sustainable will continue to be a top priority for the industry," predicts the US expert.

On the other side of the globe, Arthur Zhang considers the idea of regional independency "overrated". He believes that "globalization will continue to spread; there is no turning back. And China will be part of the system". The country has indeed grown economically more powerful as a result of the pandemic, while also expanding its political influence by achieving a breakthrough during the negotiation of the Comprehensive Agreement on Investment with the European Union. And as a member of the Regional Comprehensive Economic Partnership, China is part of the world's largest free-trade zone that stretches from the Himalayas to New Zealand and encompasses 15 countries with more than 2.2 billion people.

Be that as it may, supply chain robustness is likely to receive more attention in the future. The pandemic highlighted the value that redundancies and reserves have for companies. And when Arthur Zhang thinks about the further development of the Chinese sales center, there is one thing he will always be aware of: "The virus illustrated how everything can change from one moment to the next. And that we always have to be prepared for it to happen."

7 %

was the decrease in global CO_2 emissions in 2020.



Bounce forward

Every company wants not only to endure a crisis but to rise out of it stronger than before; in other words, to be resilient. The question is, how do they get there? What does 'ambidexterity' mean in this context? And what is the impact of the so-called 'bounce forward' effect? As part of her research work, innovation expert Marion A Weissenberger-Eibl searches for the answers.

As told to André Boße

Prof Dr Marion A Weissenberger-Eibl is Director of the Fraunhofer Institute for Systems and Innovation Research ISI and holds the Chair for Innovation and Technology Management at the Karlsruhe Institute of Technology (KIT) in Germany.

VIEWPOINT

Resilience in its most literal sense is the ability to 'bounce back' to a previous condition after a problem or an interruption, much like a Weeble toy that always rights itself when pushed over. For a company, it describes the ability to prosper over the long term and get itself back on course time and again, regardless of the direction in which it gets bent or pulled.

Resilience is an evolving concept. The goal is no longer to restore the status quo following a shock event; today it's more about companies adapting themselves to change. Change has become constant in our volatile, uncertain, complex and equivocal world. That in turn puts environmental conditions and stakeholder demands in a constant state of flux. Today when we speak of resilience, we're no longer talking about 'bouncing back' to the prior state of things, but 'bouncing forward'.

So how does that work? Take a look at the character traits of resilient people: their capability to rigorously analyze problems and easily control emotions and impulses. Furthermore, they are convinced they can change things through their own actions. Add to that attributes such as realistic optimism, empathy and goal-orientation. While these are traits that cannot be transferred to an organization, they can nevertheless help us recognize what distinguishes a resilient company.

Grappling with resilience as an organization is also a question of attitude. The company is working on scenarios that it is not sure will ever occur, and that cost resources. At first glance, efficiency and resilience appear to be natural opponents. And yet, developing resilience into a core organizational trait is an important step in strategic planning. After all, resilience leads to better risk management, and that in turn supports the long-term success of the company.

Crises primarily impact the people who work in an organization. For this reason, cultivating resilience requires a corporate culture that takes the needs of employees seriously, but at the same time encourages exploring a common path out of the difficult situation. This type of corporate culture promotes solidarity and creates a positive narrative for the future. In this respect – and studies have proven it – small-to-medium enterprises can be more resilient than large companies, because they benefit from the experience of having made the right decisions during phases of uncertainty.

"Crises primarily impact the people who work in an organization."

For companies, it's absolutely worth exploiting these advantages and further investing in resilience. A key word here is ambidexterity: we can see it on the one hand as the ability of companies to exploit known potential, for example by efficiently enhancing existing processes and products. On the other hand, ambidextrous companies are also in a position to develop disruptive innovations or explore new potential.

Ambidextrous companies are skilled at both methods. They not only respond appropriately to drastic changes, shocks and crises, but also possess the capability – with the help of resilience's 'bounce forward' effect – to take a step ahead.

Leading from the front

Although the coronavirus pandemic poses challenges for companies, it also spurs developments. And that calls for leadership. Stefan Scheiber and Matthias Altendorf talk about their experiences and insights.

Questions: Martin Raab
Photography: Jekaterina Gluzman

Inspiring environment: Stefan Scheiber (left) meets Matthias Altendorf in the CUBIC innovation center of the Bühler Group in Uzwil, Switzerland.

Mr Scheiber, Mr Altendorf, when did you first realize you had a genuine crisis on your hands with Covid-19?

Scheiber: We first recognized that we were dealing with a serious situation when our Chinese employees were no longer able to return to the plant after New Year festivities. We employ 3,500 people in China; more than 50 percent of our production capacity is located there. If everything is idle, we run the risk of our deliveries being delayed.

Altendorf: I was travelling in Asia at the same time. The passenger seated next to me on the plane thought it was time to shift to SARS mode again. He then showed me his pandemic kit: protective mask, hand disinfectant and a ballpoint pen.

What was the pen for?

Altendorf: You can use it to push elevator buttons without having to touch them with your fingers! When we arrived in Taiwan, the Taoyuan International Airport was practically deserted – something unheard of at the end of Chinese New Year. All flights to China had been canceled!

How did you respond?

Altendorf: We immediately raised it as an issue within the Executive Board and stopped all business travel to, from and within Asia. We then created a Group-wide task force.

Scheiber: For us it was crucial to get the operation in China up and running again. Luckily, we did that very quickly. And we too established a task force to manage the pandemic. This group supports the line managers who take care of operations. We did this all around the world to make sure that we protect the health of employees everywhere.

Altendorf: To be honest, though, we had no experience in dealing with an epidemic, but our colleagues in Asia did. They are usually the ones who are listening and learning in meetings. During the coronavirus pandemic, it was suddenly the other way around.

"We learned how dynamic the transformation is. That's why the ability to forge partnerships is increasingly important."

Stefan Scheiber,
CEO of the Bühler Group

Did you change your management approach during the pandemic?

Altendorf: I normally meet the Group's managing directors once a year. During the pandemic we switched to quarterly video conferences. That brought the Executive Board extremely close to business operations. We had our finger on the pulse and could immediately sense what was going on in the entities.

Scheiber: Regular communication was highly important during the pandemic. We significantly intensified the way we communicate. I had a call with all regional managers once a month. On the discussion agenda was also how we manage this situation as leaders.

Altendorf: In this situation, you must make sure that employees sense the empathy at the heart of the company. You have to show them that you are interested in how

"We experienced an incredible digitalization boost through Covid-19."

Stefan Scheiber,
CEO of the Bühler Group

they're doing and in what is happening to them; that you are not abandoning them to their problems. For me it was especially important to convey that we would have to overcome this crisis through solidarity, not selfishness. Everyone has to pitch in; together is the only way.

How did you manage to balance crisis management and strategy development?

Scheiber: We have a five-year strategy cycle that ended in 2020. It was important that we developed a new strategy during the pandemic and planned its implementation. People need a perspective, and that naturally also applies to our employees. They must have hope that the crisis will eventually pass and that the business has a future, which was why we went through with developing the strategy. That created a lot of positive energy because we proactively addressed the future and didn't retreat into our shell.

Altendorf: When you point to an end to the crisis, you also gain confidence. People have to know that there will be a time when we will have overcome the crisis. It will eventually pass. We can't say if that will be in six, 12 or 18 months, but one day it will pass.

What does the crisis mean for your business?

Scheiber: The pandemic had dramatic impacts for many of our customers. Some segments collapsed, while others boomed. The plant-based food industry has experienced enormous growth. Although we're well positioned in this market, we first had to manage the growth. The food industry is otherwise very stable. We had never experienced such a dynamic environment before.

SHAPED BY THE COMPANY

Stefan Scheiber (born 1965) graduated with a degree in business administration from the University of Applied Sciences in St Gallen, Switzerland, and later continued his education at the IMD Institute Lausanne and Harvard Business School. He started his career at Bühler in 1986, working in various international management positions worldwide, including East and South Africa, Eastern Europe and Germany. Stefan Scheiber has been a member of the Executive Board since 2005 and was appointed CEO of the Bühler Group in 2016 and a member of the Board of Directors in 2020. He is the sixth CEO in the company's 161-year history.

INNOVATIONS FOR A BETTER WORLD

The Bühler Group, headquartered in Uzwil, Switzerland, is a globally active technology company with 12,500 employees. Founded in 1860, the family-owned company generated sales of 2.7 billion Swiss francs in 2020. Bühler maintains a global network of 100 service stations, 33 production plants and application centers at 24 locations. The company develops leading process solutions and sustainable value chains within three business units – Grains & Food (safe and healthy food and feed), Consumer Foods (culinary specialties) and Advanced Materials (energy-efficient mobility and buildings).

2 billion people consume food produced on Bühler systems every day.

50% of new vehicles contain die-cast components made with Bühler technologies.

65% of the wheat harvested worldwide is turned into flour by Bühler mills.

60% of the world's cocoa crop is processed by Bühler equipment.

Altendorf: Consumers have undergone a genuine change of awareness. Health, nutrition, the environment – all of these issues have taken on enormous importance.

Scheiber: The pandemic has changed a lot of things, and that includes the realization that climate change is the major challenge for the coming years. If industry finds solid solutions so that customers can operate their plants in a more sustainable, efficient, eco-friendly and also profitable way, that's good news. It means industry is not destroying the world; it's delivering solutions to deal with our environmental problems.

What lessons are you learning from the crisis?

Scheiber: We have learned how dynamic the transformation is – in communication, technology, digitalization. That's why the ability to forge partnerships and seek collaboration is increasingly important.

Bühler is a company of engineers. We always created everything on our own, but that's not a model for the future. The world is moving so fast and change is so broad that we have to work with the best suppliers and partners and then jointly approach the customer with a novel solution. Networks are extremely important in the 21st century.

Altendorf: We have to concentrate on doing what we do best and on what creates value for the customers. That's why today, we think in terms of ecosystems. Digitalization creates new opportunities for communication and collaboration. In one-on-one environments, it's difficult to fill such an ecosystem with life. This is a lot easier to accomplish if I can interact with many partners at the same time.

Scheiber: The crisis also showed how important the physical infrastructure is with our 100-plus service stations around the world. These employees are present in the markets, in the countries, where they can move around even if the borders are closed. That's not something you can digitalize.

What do you think will stay in place after the pandemic?

Scheiber: We experienced an incredible digitalization boost thanks to Covid-19 – in everything that we do. In one year we made as much progress as we would otherwise make in five or ten years!

Altendorf: Executive Board meetings, Supervisory Board sessions, management conferences – we never imagined making all of this digital. But internally and externally, we live in a virtual world of relationships that we developed in the real world. Yet it won't work over the long term without meeting face to face or traveling.

Scheiber: The pandemic nevertheless showed that you can accomplish much with a lot less travel. I used to be on the road 40 to 50 percent of the time. But today I know there is another way. We can discuss business via video conference. In the future, I will be traveling primarily if I want to meet and talk to our employees. And for certain things, I will never travel again!

Champions of change

From travel restrictions to interrupted supply chains, the pandemic presents a challenge for companies around the world. Support from Endress+Hauser helps them to successfully manage these changes.

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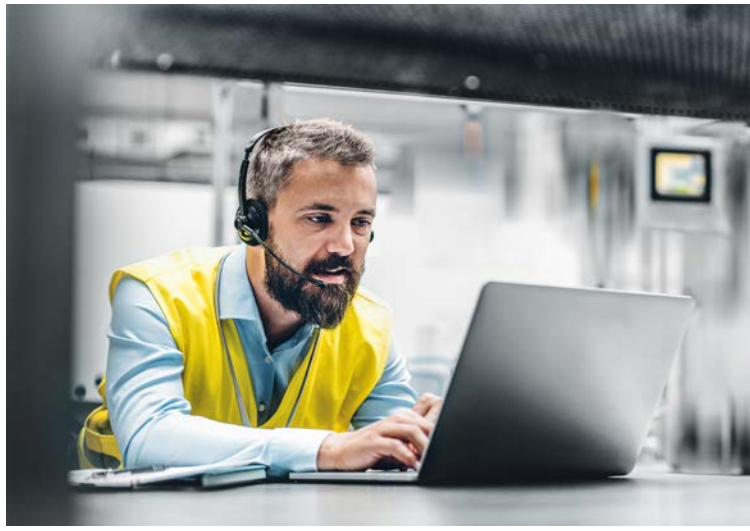


2

1
Whatever the customer needs, in most cases it's just a click away.

2
An app brings the eyes and ears of the service technician to the plant – virtually.

3
Live video streams enable remote factory acceptance tests.

3

So far – yet so near

For years, Endress+Hauser has been accelerating the pace of digitalization. This is now helping customers transcend borders and simplify their daily activities. Here are three examples.

Text: Christine Böhringer
Photography: Christoph Fein, Manuel Wittek

DIGITALIZATION

I SEE WHAT YOU SEE

In the spring of 2020, a dairy producer in Panama had a problem: a flow instrument in the water treatment area was no longer working, and fixing it would require help from an outside technician. But because of Covid-19, a travel ban was in place. What now? A service team at the dairy called Endress+Hauser technical support. Just hours later, everything was up and running again. "We resolved the problem with our new Visual Support app, which we released ahead of schedule during the pandemic and provided at no cost," says Fabio Evola, who develops global services at Endress+Hauser. The app was installed on a tablet at the dairy. A live video stream showed the Endress+Hauser technician the system and how the instrument was installed. "We used screen sharing to look at the instrument configuration," reports Fabio Evola. It then became clear that the instrument had not been properly commissioned. That was just one among more than 500 service calls to date that have been done via Visual Support. "The app is a good way to supplement in-person field service, which is why it's part of our service contracts today," says Fabio Evola. "The crucial advantage is the response time. Our technicians can quickly provide remote diagnosis and instructions during troubleshooting – and that gives the customers a sense of security." As a next step, Endress+Hauser wants to offer remote support for instrument commissioning.

TRY BEFORE YOU TRUST

"Covid-19 abruptly changed everything," says Horst Ewerth, an industrial engineer who heads up the customer project department at Endress+Hauser Level+Pressure in Maulburg, Germany. His team receives around 100 inspectors each year. These inspectors check large-scale orders to determine if the instruments manufactured in Maulburg fully conform to specifications and are suitable for the plants where they will be installed. "During the pandemic, we cannot always carry out these factory acceptance tests on-site here in Maulburg," says Horst Ewerth. His team quickly switched the acceptance tests to a virtual platform. Using secure video streams, participants can view the process from several angles as their instruments are identified, measured up, tested or even recalibrated. Images and documents are uploaded to the cloud. Now every Endress+Hauser production facility in the world offers remote factory acceptance tests – and in a uniform manner. The result is that customer projects stay on schedule. "Because they are unable to travel, many of our customers are carrying out the acceptance tests on their own," says Horst Ewerth. He is sure of one thing: "Due to their simplicity, virtual factory acceptance tests will prevail in many cases."

AN ON- AND OFF-LINE RELATIONSHIP

An Amazon-like shopping experience, a search experience similar to Google – with any kind of end device and all through endress.com. "We took an information website, applied various tools and created a platform for collaboration with our customers," says Oskar Kroll, Director Digital Business. This idea is designed so that individual customer management through the sales organization and through the digital platform perfectly and seamlessly augment one another. With this approach, customers around the world can carry out each step of the order process either online on their own or through direct contact with the Endress+Hauser sales organization. Whatever action they take, and whenever it's taken, the result lands in their personal endress.com account and can be continued online. "Customers can view all their orders and offers, as well as the delivery schedule and status, documentation and drawings," explains Oskar Kroll. The overview provided by endress.com is being used more than ever since the pandemic started, with the number of customer accounts having grown significantly since February of last year. In addition, incoming online orders doubled during the first five months of 2020 alone. "More and more customers are realizing how fast and easy it is to carry out tasks like ordering a replacement instrument or checking the delivery status by themselves, and without having to wait," adds Oskar Kroll.

Creative in a crisis

The pandemic brings significant challenges, but for modern analytical technology and remote monitoring, it becomes a springboard. Steve Beeston of the engineering and consulting firm Wood shares his experiences.

Questions: Kirsten Wörnle
Photography: Jeff Lautenberger

CUSTOMER RELATIONSHIP

Wood is a market leader in developing and delivering delayed coking units for oil refineries. You are leading a team of highly specialized engineering experts developing technological solutions. What was the biggest challenge posed by Covid-19?

One of the major challenges we faced was transitioning all employees to working from home. We made sure everybody had laptops with good internet capability to access the engineering software. Working remotely with clients in different time zones has been a tremendous challenge. We hardly have time for discussion, and in addition, it becomes very cumbersome to review piping and instrumentation diagrams, drawings or process flow diagrams on laptop screens. There is no substitute for the productivity brought by face-to-face meetings where everything can be explained in detail!

Have you been able to utilize new technologies during the pandemic?

We had some delayed coker start-ups that the subject matter experts monitored remotely utilizing virtual reality goggles, cameras and smartphones. It is of course not ideal because of the missing interaction with the operations personnel. This is especially important for training the operators.

Are the current challenges driving technological advancements in your field?

Definitely! We see several changes on the horizon. For example, there is a move towards utilizing the concept of digital twins, and there is also an increasing demand for remote monitoring for cokers and de-asphalting units. The key to this is performing real-time data measurements such as relevant quality parameters that were previously recorded in the laboratory. Endress+Hauser has a strong portfolio of analyzers with technologies such as Raman and tunable diode laser absorption spectroscopy. That is why we discussed with Endress+Hauser how we could obtain this data using these measurement principles. If we capture parameters live, we can monitor and optimize plant operation in real time.

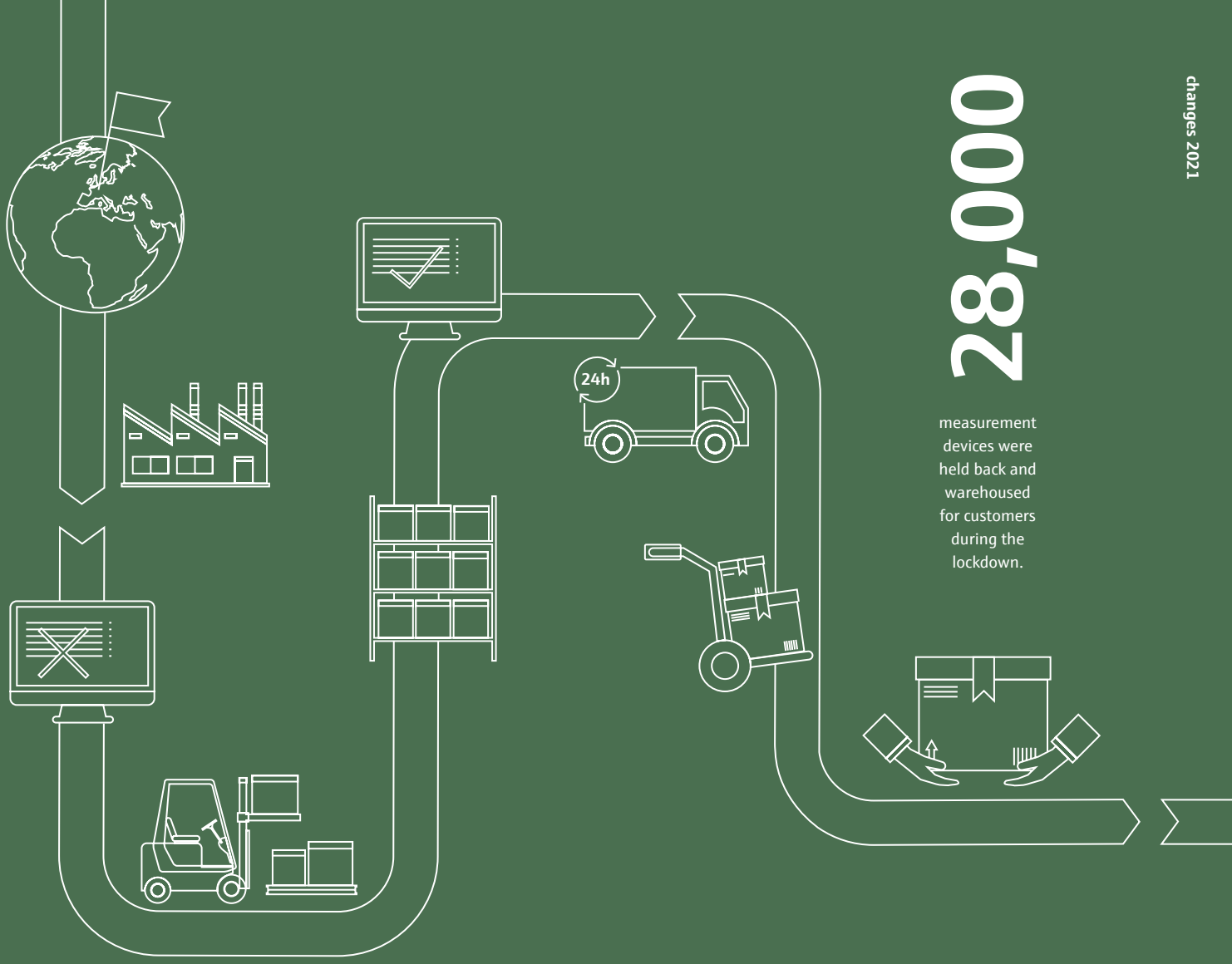
Steve Beeston is Vice President and Head of Process Technology Licensing at Wood. The group is a global leader in consulting, projects and operations solutions in the energy and built environment, and employs around 45,000 people in over 60 countries.

Would you say the crisis presented an opportunity to initiate improvements?

When you must do things differently, it promotes creativity. The home office also has advantages: Since we traveled less, we were able to use the time for further technological developments and process improvements. I'm sure that modern analysis methods and remote monitoring will make our business even more efficient. However, the pandemic will bring significant changes in other areas. There will be a more flexible attitude towards home offices and hybrid solutions to interface with clients. Keeping virtual teams together will also require leaders who set the appropriate context.

How would you describe your collaboration with Endress+Hauser during the crisis?

Knowing the staff on both sides is important and very helpful. We have been working together for decades; Endress+Hauser is one of our key suppliers for various measurement solutions. That makes it easier to move things forward together!



28,000

measurement devices were held back and warehoused for customers during the lockdown.

LOGISTICS

Tricking the system

Endress+Hauser had to keep its eye on regional lockdowns during the pandemic. Measurement instruments were warehoused – and automatically delivered to customers once they were able to accept deliveries again.

Text: Christine Böhringer
Illustration: 3st

In the spring of 2020, most business in Italy, Spain and France was at a complete standstill. Because of strict lockdowns in regions heavily impacted by the virus, companies were forced to close from one day to the next, not even able to accept deliveries. Endress+Hauser was in a position to react quickly in this situation, with the European logistics hub in Frankfurt, Germany playing a key role. Like eight other hubs around the world, this facility collects delivery-ready measurement instruments from various production centers and ships them to customers from a central point using a completely digital and automated process. At the heart of this process is a software system with the flexibility to find the best logistics provider for each delivery. “Our sales centers stored the postcodes for the lockdown regions in the system, which then automatically warehoused deliveries destined for the impacted regions at the hub,” explains Stefan Kern, IT & Data Analytics Manager at Endress+Hauser. Around 8,800 such deliveries were held back during the lockdown. As soon as lockdown restrictions were eased, the sales centers released the corresponding postcode. The system then immediately sent the instruments on their way. Since the selection of a freight forwarder was automatically controlled through intelligent algorithms, the instruments often arrived at the customer within 24 hours.

Following the trail of the pandemic

Together with Germany's largest wastewater treatment operator, Endress+Hauser is developing a process for direct, on-site detection of the novel coronavirus in wastewater, thus offering a better way to monitor local infection activity.

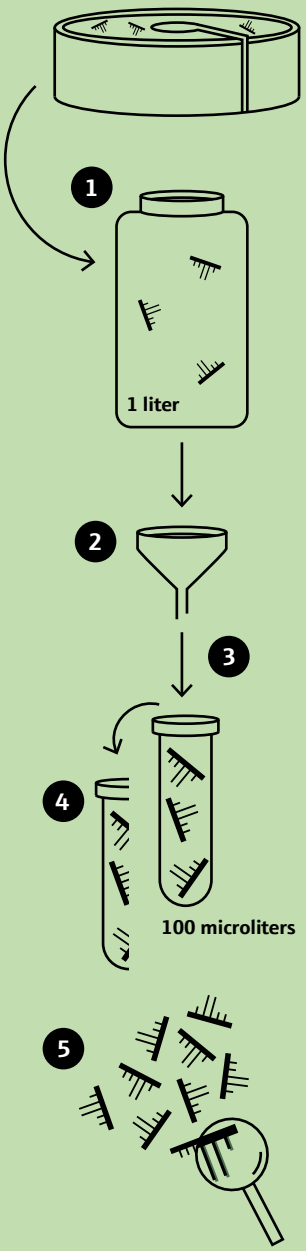
Text: Christine Böhringer
Illustration: 3st

ANALYSIS TECHNOLOGY

Since many people infected with the novel coronavirus suffer only minor symptoms, or none at all, the actual dynamic of the pandemic often stays undetectable. However, residual traces of the virus excreted by infected persons collect in wastewater, which can then be analyzed. "This is why researchers and groups around the world are active in the area of wastewater-based epidemiology, so they can better monitor what is happening with the virus," says Dr Achim Gahr, Business Development Manager at Endress+Hauser Liquid Analysis.

The coronavirus is detectable using PCR technology. In collaboration with EGLV, Germany's largest sewage treatment operator, Endress+Hauser wants to transform this laboratory analysis technology into a process. In tests so far, the partners have already successfully analyzed wastewater samples directly at the treatment plant in just three hours. "To do that, we took complex steps such as drawing and preparing samples and automated them to a large degree," says Dr Robert Möller, project manager at Analytik Jena, a subsidiary of Endress+Hauser.

Endress+Hauser has been working together with EGLV for many years. "Using this as a foundation, and because we possess all of the required technologies within the Group, we were able to quickly get the process up and running," says Achim Gahr. "We are continuing to optimize the process so that it can eventually be applied to other microbial issues."



SARS-COV-2 ANALYSIS IN WASTEWATER

1 The coronavirus genetic material, which is encoded in RNA (ribonucleic acid), can also be detected in wastewater with a quantitative real-time polymerase chain reaction (PCR) technique.

2 The analysis requires a representative wastewater sample. In this case, an automated sampler repeatedly draws water from the sewage inflow over the course of one day to obtain a 24-hour aggregate sample.

3 To prepare the sample, 100 milliliters of water is passed through a filter. The virus residue bonds to the filter and is then washed back into suspension with one milliliter of water: this increases the concentration of the virus fragments.

4 Half of the sample is placed in an instrument that automatically acquires the virus's genetic information. The extracted RNA now resides in a 100-microliter sample, which can then be analyzed with PCR technology.

5 A thermocycler amplifies the RNA sequence with the help of an enzyme. Even while running, the test shows whether the sample contains the target RNA. The earlier the RNA is detected, the higher the viral load in the sample.

Total dedication

Pranabesh Das has been working as a service technician at Endress+Hauser India for more than 10 years. To help a customer, he embarked on a journey of 1,800 kilometers and 24 days of quarantine in the middle of a hard lockdown. Why? Here he tells his story.

As told to Kirsten Wörnle

Service technician Pranabesh Das kept a refinery in India up and running in the midst of a lockdown.

CUSTOMER SERVICE

This concerned a long-term partner, an oil refinery in the northeast of India, in Assam. We have an installed base of more than 500 instruments there, and we needed to commission new radiometric level measuring devices. They are used for non-contact measurement even under extreme process conditions.

But, at that time, India had imposed a hard lockdown. Trains were at a standstill; air travel was restricted. We were only allowed to leave the house for essential supplies. It was clear to me that the plant would not continue running without our transmitters – and that only a specialized technician could commission them. So, I decided to take the risk of this 900-kilometer journey.

I boarded a flight from my hometown Kolkata to Assam. On reaching the destination, I had to quarantine myself at the airport: 10 days completely locked in a room. I started exercising in order to cope with the stress. Whenever there was internet connectivity, I tried to communicate with my family, friends and colleagues.

After 10 days, I moved to a quarantine hotel close to my customer. Every visit to the refinery site, my temperature and oxygen saturation were measured and I had to fill in a Covid-19 declaration. Only then was I allowed to work in the plant – alone and isolated from everyone else.

I have a great passion for my job and I want to grow with the challenges arising. I finished the work in 13 days: the instruments were up and running and the customer was grateful. I flew back to Kolkata, where I had to quarantine again at the airport, this time for 14 days.

Having worked for so many years as a service technician, I know that products and prices can be copied, but you can't imitate a strong customer service culture. Customers might forget what you said or what you did. But they will never forget how you made them feel!

"Customers will never forget how you made them feel!"

Under pressure to succeed

The life sciences industry, viewed as the great hope for the future, is being counted on to conquer the pandemic with vaccines. How did it manage to ramp up vaccine production so rapidly?

Text: Christine Böhringer
Photography: Christoph Fein, Martin Raab, Dominik Plüss

INDUSTRY EXPERTISE

Fast – faster – fastest: in less than a year, the life sciences industry has managed to develop and obtain approval for multiple Covid-19 vaccines. "The task now is to rapidly produce the vaccine for the whole world," says Klaus Köhler, Global Industry Manager Life Sciences at Endress+Hauser. Working under extreme pressure, manufacturers have to create enormous production capacity by retrofitting or building new plants – and equipping them with the latest technology to stay viable for the future. "To make sure that everything functions, manufacturers are relying on strong partners," adds Klaus Köhler.

Endress+Hauser focused on the biopharmaceutical industry early on. "Our first project, more than 20 years ago, involved a plant for producing long-acting insulin," says Klaus Köhler. Parallel to the growing success of the industry, Endress+Hauser developed an extensive portfolio especially for this sector that meets all its safety and quality requirements. One of the most recent innovations is Raman spectroscopy, which can be used to measure a wide range of quality parameters across the entire biopharmaceutical manufacturing process. Data consistency is provided by liquid analysis sensors that can be employed both in the lab and in the manufacturing process. Regional production enables short delivery times.

30+

Covid-19 vaccine projects are underway around the world.

"The partnership-based relationships with pharmaceutical companies and biotech startups, plus the experience we have gained, are now reaping dividends. We're helping to create the required production capacity in hundreds of projects around the globe at a record pace," says Klaus Köhler. The industry manager points out that although the industrial manufacture of mRNA vaccines is new, "in terms of production technology most of the steps are similar to those used for recombinant vaccines". Endress+Hauser has delivered thousands of measurement instruments in recent months that now monitor these manufacturing processes worldwide. "Anyone who gets vaccinated in Europe – or in fact around the globe – can be fairly sure that the vaccine was produced with the help of instruments from Endress+Hauser," adds Klaus Köhler.

1

2

3

1
The life sciences industry has stringent requirements, for example in the calibration of instruments.

2
Advanced analysis technology brings the possibilities of the lab to the manufacturing process.

3
Vaccine producers around the globe place their trust in instrumentation from Endress+Hauser.

3 questions for Klaus Köhler

Klaus Köhler is Global Industry Manager Life Sciences at Endress+Hauser.

The pandemic is reinforcing trends in many industries. Does that apply to life sciences as well?

Yes, it does. For instance, the crisis has concentrated the industry's thoughts about bringing the production of base materials from Asia back to the respective consumer countries. Dependence on just a few individual suppliers has become more apparent than ever during the lockdown. This is one of the reasons why the crisis is proving to be a driver of new technologies.

What technologies are we talking about?

We're seeing a push toward automation and digitalization in order to produce more economically. Vaccine manufacturing highlights the advantages of single-use systems such as disposable bioreactors that make biopharmaceutical production shorter, safer and more flexible. The mRNA platform technologies established as a result of Covid-19 will also make it possible to manufacture other substances using a universal process. The overall trend is toward flexible, continuous, modular and fully integrated systems.

How is Endress+Hauser supporting the industry on its path to the future?

We recently aligned our industry portfolio heavily toward the areas of single-use and digitalization, and are expanding it further. We're also bringing advanced analysis methods out of the lab and into the manufacturing process. Raman spectroscopy makes it possible to monitor bioanalytics processes and optimize them with models, all in real-time. Long term we want to further merge our portfolios for the lab and commercial manufacturing.

Vaccine for the entire world

CureVac is a pioneer in the development and manufacture of mRNA therapeutics. The company is currently expanding its Covid-19 vaccine production – supported by Endress+Hauser.

Text: Christine Böhringer
Photography: CureVac

VACCINE MANUFACTURING

It was 20 years ago that a doctoral student at the German University of Tübingen laboratory stumbled upon an unexpected phenomenon. Searching for new vaccine substances, the biologist injected mice with liposome-encapsulated RNA samples, which contain instructions for the manufacture of proteins. The body ought to recognize the protein produced by the cells as a foreign substance and trigger a defensive response. After injecting unencapsulated RNA into a control group, the young student made a surprising discovery: against all expectations, the bare RNA without a protective liposome coating triggered a strong immune response.

The young researcher at the University of Tübingen laboratory was Dr Ingmar Hoerr. One year after his serendipitous discovery, together with fellow students Dr Florian von der Mülbe and Dr Steve Pascolo and his professors Dr Hans-Georg Rammensee and Dr Günther Jung, Ingmar Hoerr founded CureVac, a company that specialized in the research and development of innovative pharmaceuticals based on messenger RNA (mRNA). The idea was that if researchers could find a way to stabilize the new method, the human body would be in a position to manufacture its own medications and vaccines. Ingmar Hoerr and his co-founders fought long and hard for the technology, as few in the industry recognized its potential. It wasn't until the coronavirus pandemic that a breakthrough was finally achieved. The technology is the foundation of the most promising vaccine against Covid-19.

STORAGE AT REFRIGERATOR TEMPERATURES

Production of the vaccine is currently in high gear at Tübingen-based CureVac. A clinical phase 3 study was launched in December 2020. Assuming the results are successful, approval is expected in the second quarter of 2021. Although other companies brought their candidates to market earlier, speed is not everything. The CureVac vaccine is easier to handle. According to initial data, it can be stored for up to three months at refrigerator temperatures. That means people in difficult-to-access regions can be vaccinated, an important advantage in efforts to ward off the virus in every corner of the world.

CureVac differs from other manufacturers in yet another way. "The company developed the end-to-end production process itself and manufactures the vaccine partially in its own plants," says Philipp Garbers, Industry Manager Life Sciences at Endress+Hauser Germany. In 2019 the authorities had already certified the world's first GMP-compliant

system for the manufacture of mRNA therapeutics at CureVac and granted approval for the production of clinical trial samples. The process is standardized and universal. All therapeutics can be manufactured on the same production platform, thus leading to faster availability of the new mRNA pharmaceutical.

As a full-service supplier, Endress+Hauser was CureVac's partner of choice for the measurement instrumentation and is currently helping the company to rapidly expand its production capacity. Another, even larger, plant is being built on the Tübingen campus, which is scheduled to go into operation in 2022 with an estimated capacity of billions of vaccine doses annually. "Standardization of the instrumentation was important to CureVac as a way to simplify the work of the production workforce," explains Philipp Garbers. The company also profits from Endress+Hauser's industry knowledge and calibration expertise. "In the pharmaceutical industry, the initial calibration of critical measuring points must be performed on-site in the qualification phase of new plants," explains Philipp Garbers. "Endress+Hauser is one of the few companies in Germany with the capability to carry out these types of calibrations on-site for a wide range of parameters."

225 million

vaccine doses have been ordered from CureVac by the European Union, with an option for another 180 million.

THE MRNA PIONEERS

CureVac AG, a global biopharmaceutical company active in the field of mRNA technology, boasts more than 20 years of experience in the development and optimization of this versatile biological molecule for medical purposes. CureVac's proprietary technology is based on using chemically unmodified RNA as a medium to instruct the body on how to produce its own correspondingly encoded proteins to combat a wide range of diseases. With this technology as a foundation, the company has established an extensive clinical pipeline in the areas of prophylactic vaccines, cancer therapies, antibody therapies and the treatment of rare diseases. CureVac is headquartered in Tübingen, Germany and employs more than 600 people at its locations in Tübingen and Frankfurt (Germany) and Boston, Massachusetts (USA).

www.curevac.com

Hub for East Africa

1
A view of Dar es Salaam. The dock at the oil terminal extends about 500 meters into the port basin.

2
The metering skids at the three ports in Dar es Salaam, Mtwara and Tanga represent Endress+Hauser's most extensive new installation yet.

2

With its three modernized seaports in Dar es Salaam, Tanga and Mtwara, Tanzania wants to reinforce its role as a major trade center in East Africa. To support this effort, Endress+Hauser is supplying advanced measurement technology – an extraordinary project that turned into a real challenge under pandemic conditions.

Text: Robert Habi
Photography: Sam Vox

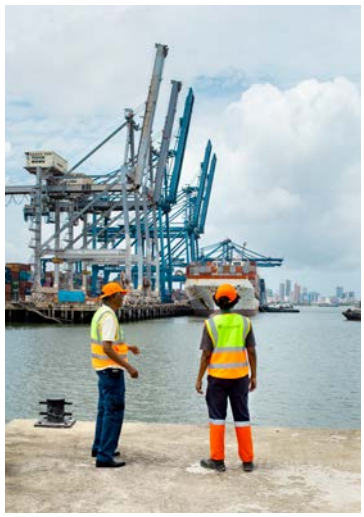
For once, Riccardo Cremascoli is actually in his home office in Milan when he picks up the phone. Most of the time, callers will catch him while he is on the road. As Head of Project Operations at Endress+Hauser, he is responsible for managing large-scale projects around the entire world. That's why there tends to be very little that impresses the native Italian. But when he talks about the three-port project in Tanzania, you can hear the excitement in his voice. "This order is something special. Our projects often involve expanding existing plants with one, two or sometimes even four skids." These large steel frames house the measurement technology from Endress+Hauser, including piping, valves, other system components and the necessary cables. "In Tanzania, however, we built three completely new facilities with 19 skids, some of them double decks, including a whole series of ancillary modules."

First things first, though. The customer – the Tanzania Ports Authority (TPA) – had ordered a complete turnkey package for the three seaports in Dar es Salaam, Tanga and Mtwara. The 19 liquid products that are unloaded there were to receive their own metering skids, each equipped with high-precision instrumentation. Everything was to be single-sourced, from system engineering and manufacture, to transport, construction of the foundations, on-site assembly and commissioning: a real challenge. In order to successfully structure such a complex project with numerous sub-phases, Riccardo Cremascoli has a principle he swears by. "You have to provide the entire team with a precise vision of the objective – not building the house before you select the windows and the rest, but having the big picture in mind from the very start."

COMPETITION ON THE COAST

For TPA, the metering systems completed the government's big picture: state-of-the-art seaports capable of holding their own as maritime trade centers against competitors in the region. The question is who will serve the future flow of goods to and from Africa's inland countries such as Malawi, Zambia, Burundi, Rwanda, Uganda and the Democratic Republic of Congo, where rapidly growing populations are set to drive the volume of freight cargo handling to increasingly higher levels.

Apart from the two seaports in Tanga in the north and Mtwara in the south, Tanzania is investing foremost in Dar es Salaam, its most important transshipment hub. The seaport in the former capital city is the trade center for 95 percent of the East African country's imports and exports, and the beacon of hope for a city that is generating a huge surge in demand. Once a small fishing village on the Indian Ocean, Dar es Salaam – an Arabic name that means 'House of Peace' – is currently the world's 11th fastest growing city. According to estimates from the United Nations, nearly 13.5 million people will live here by the year 2035, twice as many as today.



View of the container port, which is also undergoing a phased modernization.

INFRASTRUCTURE INVESTMENT

Raymond Lusekelo, Supply and Logistics Manager who works on behalf of TPA, explains the key benefit of the port project. "For one thing, precise measuring technology will ensure fair business deals between suppliers and importers. Moreover, the country is aggressively investing in cost-effective transport infrastructures to enable streamlined transportation of goods both within and beyond the country's borders," he says, adding that "this makes Dar es Salaam a preferred route for transit goods."

A lot is being done to eventually fulfill this pledge. Since 2017, the World Bank, among others, has invested 345 million US dollars in larger berths, deeper navigation channels and improved port infrastructure. On top of that is a recently expanded rail network which, according to a 2019 report from the Dar es Salaam Central Corridor Transport Observatory, will provide significantly lower transport costs. One building block remains before a sustainable seaport can be established: optimal management of liquid products such as gasoline, lubricating oils, edible oils and other hydrocarbons that have to be measured during custody transfer from the ships to the tank depots. Such was the language in the order when TPA awarded the project in 2018.

HALLMARK ACCURACY

Yona Malago, who is responsible for the process systems at the Dar es Salaam oil terminal, explains why Endress+Hauser ultimately prevailed. "TPA wanted to establish a new turnkey custody transfer system that will operate reliably and precisely over the course of its life cycle – and with the lowest possible maintenance costs." Apart from the Promass F product lines, the solution that

“You have to provide a precise vision of the objective from the start – not building the house before you select the windows and the rest.”

Riccardo Cremascoli,
Head of Project Operations,
Endress+Hauser

95 %

of Tanzania’s imports and exports go through the Dar es Salaam seaport.

changes 2021

1

2

3

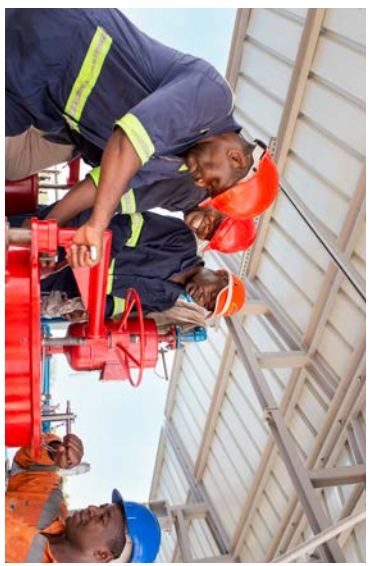
1
The 14 skids in Dar es Salaam measure all liquid products offloaded by tanker ships.

2
Riccardo Cremascoli manages projects around the globe for Endress+Hauser.

3
The skids, as high as a house, sometimes require climbing skills.

“Precise measuring technology and a cost-effective transport infrastructure make Dar es Salaam a preferred route for transit goods.”

Raymond Lusekelo,
logistics expert at the Dar es Salaam seaport



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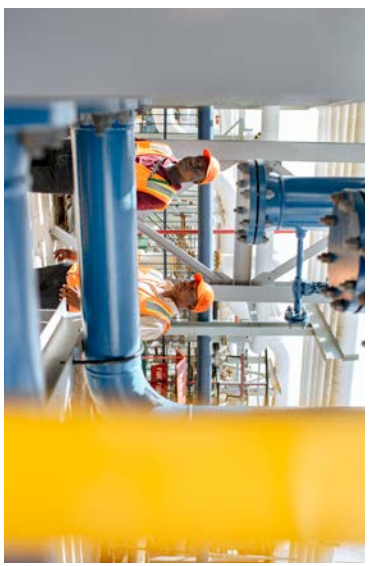


3

1
Thousands of screws and bolts: assembly is a team effort.

2
The customer utilizes highly precise Coriolis-based Promass flowmeters.

3
Local authorities, and future users, have to familiarize themselves with the new system.

crystallized during discussions involved the largest Promass X available in the portfolio, with bore diameters of 6 to 12 inches. These instruments operate on the Coriolis principle, which relies on a combination of measurement methods to avoid inaccuracies caused by entrained air, for instance.

The 19 skids, carrying a total of 29 measurement lines, all require individual adaptation. And for the first time, measurement data from the ports should all automatically flow to a central point at TPA. Although this entails a lot of effort, it brings readily apparent benefits for customers. "Liquid goods suppliers can utilize a convenient and precise custody transfer point with shorter berthing times. And improved quantity control makes for more reliability when it comes to the taxes and fees levied on goods by government agencies," says Yona Malago.

TEST BUILD IN MILAN

With this specification, the actual implementation kicked off in February 2019. After a visit to Tanzania, Riccardo Cremascoli and his team decided to avoid unwelcome surprises by building a test setup of the complete system in Milan: pipe for pipe, valve for valve, until all measurement components were operational. They also created a 3D model of the entire system for on-screen viewing. Over the course of a factory acceptance test, the team tested all the functions before everything was packed for shipment. This in turn makes it easier for the on-site contract partner. "We documented every detail and every step in drawings, exactly and precisely," describes Riccardo Cremascoli. "It's the same principle used by that big furniture retailer in Sweden, the only difference being that here we are dealing with systems that weigh tons." Perfectly packed containers were then sent via the Genoa seaport on their journey to Dar es Salaam, and from there by road to the other locations in Mtwara and Tanga.

19

skids support a total of

29

measurement lines

ON-SITE ORCHESTRATION

In Tanzania, Azer Coban, project manager for Endress+Hauser, coordinates processes at the installation site. For him, easing into the task was something unforgettable. "Previously I had always acted in a project support role, but this time I was able to manage the installation of a large-scale project. It was a terrific experience. Thanks to my colleagues, the TPA and our local partners, we accomplished our task with much dedication and hard work." The plan included work on foundations, cabling, connecting the system to existing infrastructure and, like with any large-scale project, improvising when the unexpected occurred – because like with so many projects in 2020, the coronavirus pandemic hampered freight logistics, travel and collaboration. "We fortunately shipped all of the components during summertime in Europe while supply chains were quite stable. But on-site, with social distancing and hygiene guidelines, it's of course more difficult to adhere to a schedule. Heavy rains cost us a good week in addition," recalls Azer Coban.

READY FOR COMMISSIONING

After an intense construction phase lasting until November 2020, the record project was ready for commissioning. Hundreds of tons of cement, thousands of meters of cables, interconnections, pipes – everything in its intended place. Next came intense pre-testing. The measurement lines for tankers have been in operation in Dar es Salaam since December 2020. The sister ports in Tanga and Mtwara followed in March 2021. "The way that Endress+Hauser and all of the project participants adhered to the schedule was really very impressive," says Yona Malago from TPA.

For Riccardo Cremascoli, an installed system means being on-site again and carrying out training to provide everyone involved with further insights into the functions. Among the 80 or so participants were representatives from TPA, the tax and fuel authorities and quality inspectors. Riccardo Cremascoli paints another clear-cut picture of the current status: "If we use driving as an analogy, then we have already learned the basic functions like steering, braking and starting off." The actual hands-on experience for the technicians will come when ships begin to arrive for offloading.

THE CORIOLIS MEASUREMENT PRINCIPLE

Each of the 19 metering skids distributed over the three ports in Dar es Salaam, Tanga and Mtwara are equipped with Coriolis-based flowmeters. These instruments contain measuring tubes, which an exciter causes to oscillate artificially. As soon as the fluid starts to flow in the measuring tubes, additional twisting is imposed on this oscillation due to the fluid's inertia: the impact of the so-called Coriolis force. Sensors detect this change of the tube oscillation in time and space as the phase difference. This difference is a direct measure of the mass flow. The fluid density can also be determined from the oscillation frequency of the measuring tubes.

"Our people expanded their skills through the new measurement technology and, in turn, were able to bring their experience with oil and gas systems."

John Bura,
CEO BQ Contractors

LOCAL PARTNERS

The tried-and-true principle of experts from Endress+Hauser working together with local partners to commission a system has proven to be a success story in Tanzania as well. Employees of BQ Contractors, who helped to construct foundations, piping tie-ins and electrical connections and to reassemble the skids, were always on-site. "Our people expanded their skills through the new measurement technology and, in turn, were able to bring their experience with oil and gas systems to the project," says CEO John Bura, fully convinced by the benefits of the collaboration. "The partnership with Endress+Hauser during the three-port project promoted growth at BQ Contractors and strengthened our role as a national contractor for government projects."

COMPLEX MEASUREMENT PROCESS

What Riccardo Cremascoli conveys in detail to participants at the location, works in simple terms as follows: a tanker docks at a 500-meter-long berth and transfers its liquid cargo through one of the 19 pipelines. Once on shore, motorized valves then direct the product to its intended metering skid, where the instrumentation registers mass flow, density, temperature and pressure. Meanwhile, an air separator ensures the measurements are free of entrained air. A system that automatically takes samples for laboratory checks is also integrated into the skid. If the customer wants to check the accuracy of the system over time, calibration can be carried out with mobile piston provers from Endress+Hauser.

JOINED-UP MEASUREMENT DATA

One of the biggest innovations for the port authority, apart from the measurement instrumentation, is the linking of all of the measurement data and the ability to control the motorized valves from one control room. How much has been measured? How long will the offloading take? Is the medium running through the line with the correct pressure? These questions can be answered at a glance with software. "We can immediately detect deviations at all three ports and react quickly. This is highly important data access that we have lacked until now," says Raymond Lusekelo for the port authority. Two computers for each measurement line gather and process the signals. The data is all visualized some three kilometers north at TPA headquarters at the entrance to the Dar es Salaam port.

Here, with the installed hardware, begins the exciting phase as soon as all three ports are in regular operation. Raymond Lusekelo and Yona Malago are confident in any case. "Over the next three months, we will achieve the accuracy that we need to be a reliable trade center." It goes without saying that Endress+Hauser technicians are also on hand: the record project includes a service agreement. And that means Riccardo Cremascoli will certainly be packing his bags again soon.

1

2

3

4

5

1
A tanker ties up at the long berth and feeds its liquid products into one of the 19 pipelines.

2
Crude oil, gasoline and edible oils flow through here, each product with its separate line.

3
Instruments in the skids detect mass flow, density and temperature.

4
The new control room in Dar es Salaam.

5
Measurement data from the three ports and the controls for the motorized valves all converge at the control room.

An invisibility cloak

Cyberattacks targeting industrial plants can have grave consequences. And yet, many security concepts are either too complicated or too vulnerable. Cryptography experts at Endress+Hauser have developed the CPace standard, which uses simple passwords to provide a level of protection approaching that of certificate-based systems.

Text: Laurin Paschek
Illustration: 3st

Digitalization promises greater productivity, efficiency and operational safety through connectivity between process engineering systems. Important components of industrial digitalization include field devices for measurement, control and regulation that are connected to the internet via technologies such as Bluetooth gateways. This connectivity has its price though, because it offers an attack surface to hackers and cybercriminals. If field instruments are tampered with, there is risk of a production standstill – or even plant damage and endangerment of people nearby.

ASYMMETRIC CRYPTOGRAPHY

Cryptologists have developed asymmetric methods to avoid such situations. Rather than relying on just a single encryption key, these methods work with a pair of keys, one public and one private. Stored in digital certificates, these two keys must engage with one another before data can be exchanged. Yet when there are numerous small communication partners, which is often the case in industrial environments, this process soon becomes highly complex, requires extensive computing power and results in correspondingly high power consumption.

PASSWORD-BASED METHODS

Password-based protection systems are user-friendly in comparison, but are very prone to hacking with offline cyberattacks. Here, hackers first steal password-related information, for example by intercepting encrypted data during a login sequence. They then try out different passwords offline on their local computer until they find the correct one. The only way to prevent an attack like this from succeeding is by using sufficiently long encryption keys.

INVISIBILITY CLOAKS AND TRAPDOORS

The CPace method developed by Endress+Hauser offers a happy medium. This method is easy to manage because it also functions with shorter, user-friendly passwords. It's secure at the same time, since no password-related information is divulged during authentication between the field instrument and operations terminal. This 'zero knowledge' approach relies on concealing data in background noise that works like an invisibility cloak. An attacker then has no option but to try out extremely long key sequences – and the chances for success dwindle to zero.

The CPace protocol differentiates between good and bad. Authorized users who know the password are immediately identified as such and directed through 'trapdoors' during authentication. These trapdoors are hidden shortcuts that significantly reduce computing time and power consumption. So the CPace method is particularly well suited for use in process engineering environments with hundreds or thousands of connected field instruments.

APPROVED BY IETF

The CPace method has the potential to eventually protect internet-based applications well beyond the process industry. The CPace protocol has been recommended by the Internet Engineering Task Force (IETF), which oversees the standardization of internet communication protocols such as IP, TCP and HTTP.

ZERO KNOWLEDGE METHOD

1

To connect process plants, the instruments – in this case a temperature transmitter – are connected to the internet via a gateway with Bluetooth technology.

2

The problem here is that the wireless link offers an attack surface to cybercriminals who can then intercept passwords, for example.

3

With the 'zero knowledge' method, there is background noise masking the actual information; an attacker would have to interpret extremely long key sequences.

4

Yet authorized users who know the password are immediately identified, providing them with a simplified way to log on. This process requires only minimal computing power in the field instrument.

Thumbs up

A lifetime bond? It's certainly possible. Many people work for years or even decades at Endress+Hauser. Here they find the space to develop their careers, happy to play a part in a company that combines economic success with ecological and social responsibility.

Text: Martin Raab
Photography and illustration: Endress+Hauser, Christoph Fein, Getty Images, Shutterstock, 3st

29.6 percent of employees at Endress+Hauser are women.

101 nationalities work for the Group.

5 employees have more than 45 years of service to the company.

332 young people are pursuing vocational education at Endress+Hauser.

10.3 years is the average length of employment.

A boost for female power

The higher you go in the company hierarchy, the more it's a man's world. Today, one out of every six management positions at Endress+Hauser is held by a woman – although nearly one-third of the workforce is female. At Endress+Hauser, the conference table will one day be more diverse and colorful. The goal is to increase the presence of female managers to around 30 percent by the year 2030.

Paving the way to this goal is the Women's Integrated Network, a global initiative whose members develop local measures at locations around the world. One of the objectives is to attract more women to the company, seeking a target of 40 percent at all levels. Another goal is to encourage women to assume responsibility for personnel, projects and technical areas.

Job advertisements will be written so that they appeal to both genders. The company wants to make managers aware of unconscious bias when selecting personnel. Endress+Hauser wants to specifically target the professional development of female employees and further improve work-life balance. Finally, female role models in the company should enjoy increased visibility.

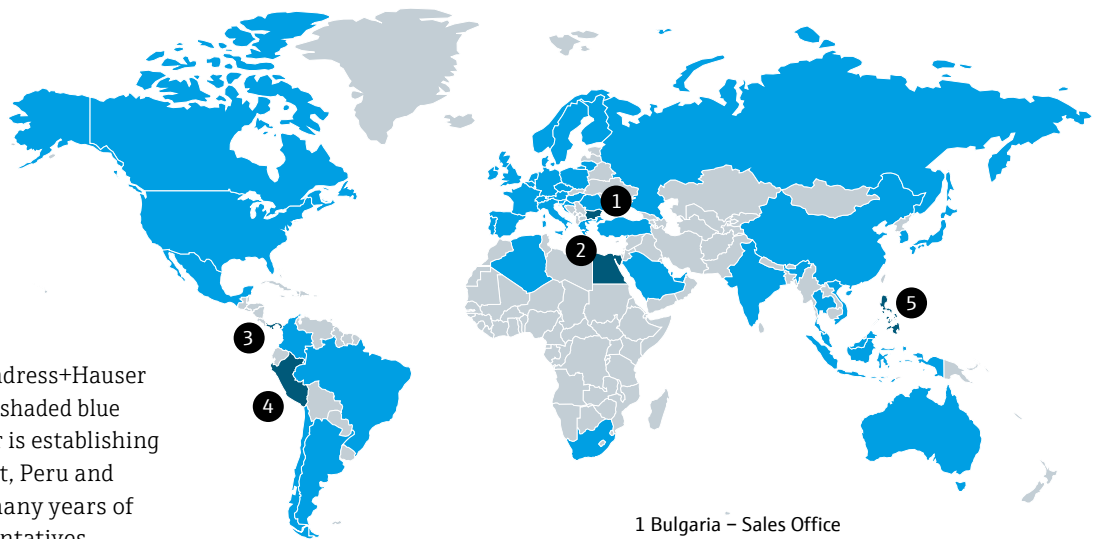
Behind all of this is the conviction that diversity makes companies more successful. As more people with different perspectives become involved in the company, the more robust, agile and innovative the organization becomes. For this reason, Endress+Hauser wants all of its employees to feel comfortable and free to flourish, regardless of gender, age, ethnic background, religious and ideological beliefs or sexual orientation.

Time for the kids

The lockdown was often a double burden for parents. Moms and dads suddenly had to work from home while simultaneously caring for the kids on their own or helping them with their schooling. Where necessary and possible, Endress+Hauser sought flexible solutions and gave parents a maximum of five days to arrange childcare on short notice.

The blue world

Four more countries on the Endress+Hauser sales organization map will be shaded blue in the future. Endress+Hauser is establishing sales offices in Bulgaria, Egypt, Peru and the Philippines, all built on many years of activity by local sales representatives. And in Panama, the Group will provide the established sales support for Latin America with its own legal entity.



1 Bulgaria – Sales Office
2 Egypt – Sales Office
3 Panama – Regional Support Center
4 Peru – Sales Office
5 Philippines – Sales Office

Donating know-how

No visits, no events, no training programs. How can trustworthy relationships be built in such an environment? Companies are not the only ones facing this challenge during the pandemic. Humedica, a humanitarian assistance organization based in Kaufbeuren, Germany, was also struggling with the abrupt severance of personal contact with donors and volunteers. It's a good thing that experts in digital learning and virtual knowledge transfer are nearby. The team at Endress+Hauser Temperature+System Products in Nesselwang readily shared its theoretical and practical know-how with the team at Humedica, which now wants to increasingly connect with supporters in an online environment, ensuring that the humanitarian assistance organization can continue with its activities in more than 30 countries around the world. **humedica.org**

Up and running again

Full of vim and vigor, the Endress+Hauser Water Challenge was launched in 2019. With this initiative, employees around the world collected donations through charity runs – with the company doubling the donated sums – to bring people access to clean water. Although the coronavirus crisis brought these activities to a halt, employees found a way to dodge the pandemic with the Winter Water Challenge: skiing, snowshoeing or jogging, each employee alone but all with the same goal. The proceeds from this and other campaigns are flowing into a new project in the Philippines. In the province of Cavite, a two-hour drive south of Manila, the plan is to connect 80 households to the water supply system, thus permanently improving the living conditions of 400 people.

International hub

Endress+Hauser is strengthening its logistics network in Europe. In Wörrstadt, Germany, near Frankfurt Airport, a new logistics center will start up in mid-2021. The hub, operated by Hellmann Worldwide Logistics, can handle eight times the volume of the current system. The new logistics hub will bundle all products belonging to an order and ship them to domestic and international customers. It will bring supplies to overseas production locations as well. The logistics center will also receive and distribute materials destined for Endress+Hauser production facilities in Europe. Shuttle trucks that deliver products will return with supplier parts, thus improving the eco-balance of the entire supply chain.

1,000,000

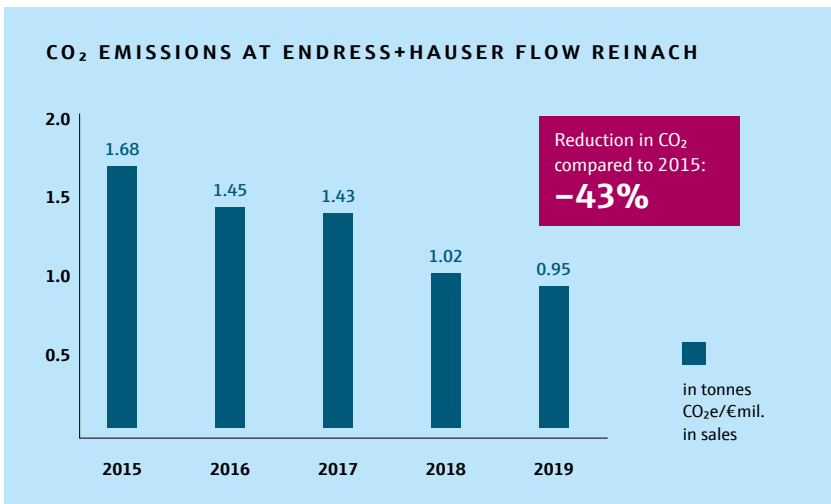
300,000 protective masks for entities in countries heavily impacted by Covid-19 were distributed by Endress+Hauser China at no cost when the pandemic first hit. Another 700,000 were acquired centrally with the help of colleagues in China to supply employees across 25 Group companies with masks.

Leader in climate protection

In Reinach, Switzerland, Endress+Hauser produces world-class measurement technology – and combines this with outstanding climate protection. Within five years, the Reinach product center reduced its relative greenhouse emissions by 43 percent, from 1.68 to 0.95 equivalent tonnes of CO_2 per million euros in sales. In recognition of these efforts, a survey conducted by Bilanz magazine, daily newspaper Le Temps and the Statista statistics portal ranked the location as being among Switzerland's top 20 companies. Behind this success lie continuous investments in energy efficiency, plus the fact that the plant is powered entirely from renewable sources. The ambitious goal is to reduce the site's CO_2 emissions to zero by the year 2030.

"We help our customers achieve their sustainability targets, so we want to be a pioneer in sustainability ourselves."

Pascal Meury, Energy Manager at Endress+Hauser Flow Reinach



2020

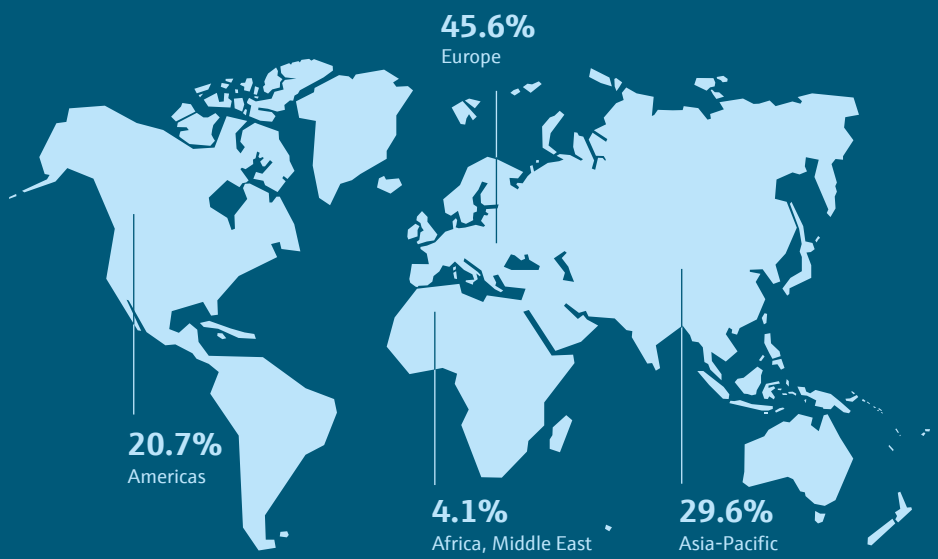
The financial year at a glance

Net sales

€ 2.58 bil.

(–2.8%)

Sales by region



Return on sales

13.1 %

(2019: 13.1%)

“Disciplined and flexible spending helped offset the decline in sales. The laboratory business also made a strong contribution.

Investments

€ 206 mil.

(2019: € 231 mil.)

Net income

€ 255 mil.

(–4.1%)

“ Right at the beginning of the pandemic, Endress+Hauser committed to safeguarding jobs and avoiding a reduction in working hours. New jobs were created only where it was necessary and reasonable for the business, but virtually all apprentices were offered positions upon completion of their training.

Employees

14,454

(+126)

Solid performance during the crisis

Consolidated sales for the Endress+Hauser Group fell nearly three percent during 2020, a year impacted by the pandemic. We missed our growth targets as a result. The majority of this decline, however, is tied to exchange rate effects, without which sales would have remained nearly at the prior-year level. Individual regions, industries and fields of business nonetheless developed very differently. While China grew, for instance, sales declined in the United States and Germany. Cyclical industries performed worse than non-cyclical sectors. And while the laboratory business experienced strong growth during the pandemic, the process automation business suffered.

DR LUC SCHULTHEISS, CFO

CO_2 emissions per €1 mil. in sales

8.9 t

(2019: 10.1 t)

“ Home office instead of business travel: due to lockdowns, plus contact and travel restrictions, employee business travel was curtailed significantly, with an impact on CO_2 emissions. Although video conferences and online services can serve as an alternative to some travel, personal contact remains important for building trust, solving problems and managing customer relationships.

R&D ratio

7.6 %

(2019: 7.6%)

Patent filings

276

(2019: 318)

“ The number of patent filings dropped off during lockdown. Innovation strength is unbroken, with more than 74 new products scheduled for introduction in 2021.

EcoVadis rating: Gold status

72/100

points

(2019: 68 points)

Bestowing confidence

Solidarity is crucial in a crisis. Klaus Endress and Matthias Altendorf agree that its foundation has to be laid during good times.

Questions: Martin Raab
Photography: Andreas Mader

"One of the most important tasks for top management during a crisis is to provide a sense of security."

Klaus Endress,
Supervisory Board President
of the Endress+Hauser Group

Mr Endress, how has the coronavirus pandemic changed your life?

Endress: Being outside, getting exercise, mindfully enjoying nature: these are things I have been doing my entire life. I'm simply doing more of this because of the pandemic.

How about you, Mr Altendorf?

Altendorf: My situation is similar. I get outdoors to do my exercise and let myself be stimulated by nature. What has helped me is discipline. I have the same rhythm regardless of whether I am working from home or at the office. What I sorely miss are the cultural activities: concerts, exhibitions, theater, all of the things that usually inspire us.

How does this impact your job?

Altendorf: As the chief executive of a company, I cannot afford to lose my confidence. I have to be optimistic, yet stay realistic and objective. This balancing act becomes more difficult in the absence of interaction with the outside world. That's why I always seek the long view: a strategy, a long-term goal. This long-term perspective helps me to stay positive.

How does that long view shape up at Endress+Hauser?

Altendorf: We said from the start that we want to focus on protecting people and do the best job possible of serving our customers. And without being able to foresee the impact of the pandemic, it was nonetheless important to us to sidestep short-time working if at all possible, and avoid layoffs. At the same time we decided not to cut back on any of our large-scale investments. We stuck with all of this. But we thought through scenarios in terms of their economic impact on the company.

And where did you eventually land?

Altendorf: In hard numbers, we are running 2.8 percent behind last year, although currency exchange rate fluctuations are having the biggest impact. Return on sales remained on target. We created 126 new jobs and hired virtually all of our apprentices who finished their training. All told, we can be satisfied with the results.

Endress: In light of the circumstances, these are good, even enviable, figures. One key aspect was certainly the fact that we learned a few things from the financial crisis in 2008/2009: that we need to think in all possible, and impossible, directions, including crazy ideas, and then implement them if they help us. People can do this only if they have a sense of security. And one of the most important tasks for top management during a crisis is to provide this security.

How do you make that work?

Endress: By sending out the message during a crisis that we will avoid short-time working, that we will make our way through this together. The employees see that the situation is not easy, but they realize they are not being let go, that they have work and can give 100 percent. What distinguishes us and other good companies from the rest of the world is solidarity. It sounds a bit exaggerated, but we're one big family. Here there is a 'we' feeling. That mobilizes incredible forces!

Altendorf: People feel this solidarity. There is an inherent sense of trust in the company, which has to be earned and renewed time and time again. The former head of Deutsche Bank, Alfred Herrhausen, once said: "We have to say what we think. We have to do what we say. We also have to be what we do."

What does the pandemic mean for solidarity within the shareholder family, Mr Endress?

Endress: We held a meeting between the inner circle of family members and top management right at the beginning of last year. After that, practically all in-person encounters were canceled. There is a large flow of information, but the physical presence is missing. That wears you down!

Mr Altendorf, how is the coronavirus changing the world of Endress+Hauser and that of the customers?

Altendorf: I see four major elements. One point is the future of sales, the interface to the market and customers. In the image of the tree that Mr Endress likes to use, this is the crown. We need a larger surface that can absorb the sunlight in order to close the gaps and achieve a greater presence. In this case we have to utilize every available opportunity in the interaction between the analog and digital worlds.

Endress: Digitalization and online platforms create additional access to the market and customers. The further we branch out, the better it is for us. The digital world will not replace the physical sales environment, however. People always need people. The terms 'knowledge' and 'warmth' are incredibly important: knowledge can be digitally transported, but warmth requires closeness. When the media says home working is the future, that's wrong. Employees miss interacting with other people when they work from home.

Altendorf: The way in which we work together will nevertheless change – and that's another element. When people are all physically present in a room, collaboration is different than if they are collaborating in a mixed or fully digital environment.

LINK TO THE FAMILY

Dr Klaus Endress, born in 1948, earned a degree in industrial engineering from the Technical University Berlin. He joined his father's company in 1979, took over Group management in 1995 as CEO and moved to the Supervisory Board in 2014 as president. Klaus Endress is married and the father of two grown children. Whenever possible, the passionate horse rider and mountain biker heads outdoors and into nature, accompanied frequently by Maya, the family dog.

"As CEO, I cannot afford to lose my confidence. That's why I always seek the long view. This helps me to stay positive."

Matthias Altendorf,
CEO of the Endress+Hauser Group

"What distinguishes us and other good companies from the rest of the world is solidarity."

Klaus Endress,
Supervisory Board President of the Endress+Hauser Group

You talked about four elements...

Altendorf: A third element is the meaning of work. Particularly in Western societies, people are searching for meaning. For a long time we were concerned about the possibility of not finding enough qualified employees; today I'm convinced there will always be enough people who want to work for Endress+Hauser – as long as we provide what they are looking for. Added to that is the way we deal with people. But most of all, what we do is exciting because we deal with fundamental global challenges. Our activities have great value, not just for the company, but also for society.

And the fourth?

Altendorf: The fourth element is robustness of supply chains. With countries closing their borders, supply chains have been interrupted. Endress+Hauser was able to ensure the availability of materials, but many of our customers experienced difficulties. That will lead to new thoughts about how supply chains will be organized.

Endress: What it all boils down to is an incredibly high degree of flexibility that everyone must have!

Is there anything else that we can learn from the crisis?

Endress: After the crisis is before the crisis. During the financial crisis we discovered that biotechnology and life sciences were continuing to boom – precisely the areas where we were not performing well. We changed that. We invested, made acquisitions and strengthened our expertise in the field of analysis technology. We also moved into the laboratory business. All of these things helped us tremendously over the past year.

Prior to Covid-19, protection of the climate and the environment dominated public discourse. What happens next?

Altendorf: People have developed a different awareness of issues such as health, nutrition and protecting the environment. And climate change is not going away. It's something that must and will occupy all of us as humans. Government policies create the framework, such as the European Union and its climate objectives. And I see lots of efforts by industry to reduce the carbon footprint.

Endress: Coronavirus will help us to become more sustainable.

Looking to the future, do you think the most difficult times are still ahead of us when it comes to the pandemic?

Altendorf: The pandemic will certainly keep us and society occupied for a very long time to come. The first nine months of this year will likely be a struggle until larger segments of society gain a sense of security and confidence through vaccinations. Vaccinations are the only thing that can return us to a sense of normality similar to what we had before. The old normality will never return... but I do believe the economy will then experience a certain degree of momentum.

Endress: Confidence is the key. Without it, there are no investments – and no growth. But I'm confident we will reach our targets, because within the company there is much that has been created and further developed over a period of decades. We have tremendous people and first-rate offerings. And we've never had so many great product innovations as we do this year!

"The pandemic will keep us and society occupied for a long time to come."

Matthias Altendorf,
CEO of the Endress+Hauser Group

ROOTS IN THE COMPANY

Matthias Altendorf, born in 1967, began his career at Endress+Hauser with vocational training as a technician, followed by studies, stays abroad and further education. He was appointed to the Executive Board in 2009 and became the Group's CEO in 2014. He balances his work life by sailing, playing chess, riding his motorcycle and spending time working in the woods. Travel, the arts and reading round out his hobbies. Matthias Altendorf is married and the father of a grown son.

1

1
In normal times, a place for personal encounters: the headquarters in Reinach, Switzerland.

2
Physical distance, ideal proximity: Matthias Altendorf (right) in discussion with Klaus Endress, here on the roof terrace of the company building.

2

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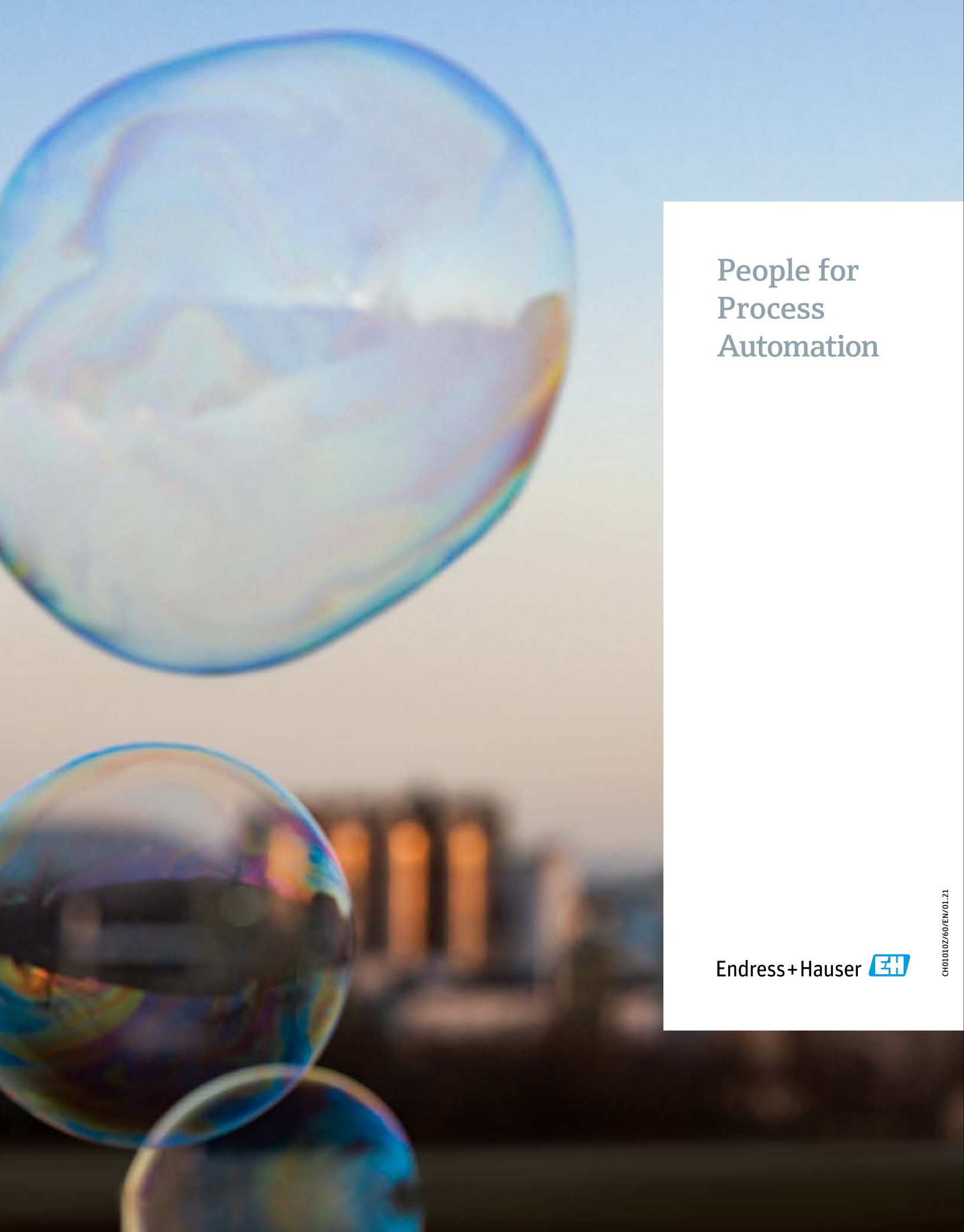

People for Process Automation

Endress+Hauser

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