INFLUENCING THE FOOD INDUSTRY
HOW CONSUMERS SET THE NARRATIVE WITH SOCIAL MEDIA

PARTNERING FOR BETTER OUTCOMES
NEW SERVICE OFFERINGS DRIVE CUSTOMER SUCCESS

PLANTING THE “MEAT” OF THE FUTURE
ALTERNATIVES TO ANIMAL PROTEINS ARE BOOMING
At Bühler, 2020 has been a year of discovery. It made us rethink the way we do business. In tough times, you can either hunker down or pursue opportunities. Our choice is clear – let’s be dynamic and transformative. Let’s harness our energies and direct them into creating and innovating. Let’s be agile, because the world is changing fast. In our company, this can-do mindset unleashed strengths within our employees that far surpassed my expectations.

We continued to innovate. We served our customers throughout lockdown challenges. We helped secure the food supply chains. We developed new digital solutions and even held our first fully digital trade show. We commissioned new plants remotely, and we continued to train talent, both internally and externally. This makes me proud. This whole year was a brilliant story of collaboration with our customers. It reinforces my belief that passionate people can change the world.

#innovationsforabetterworld #wevegotyoucovered #strongertogether #hereforyou #inspiration #transformation #bestpeople #buhlergroup
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#EXTRAMILE

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Hello! 😊

We are here for our customers – always! #success

We strive to cover your needs, both in good times and in challenging ones. Whatever the situation, we are ready to assist you with services, advice, expertise, and innovations that will help prepare you for the future. #hereforyou

Our experts understand what consumers want and will support you in your plans to not only meet the current trends, but also to anticipate what’s to come. #wecare

Whether your business is big or small, we offer a breadth of solutions tailored to your needs. In this issue, we showcase some examples of how we collaborate with you. #strongertogether

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#wevegotyoucovered 💚
“DON’T LET THE OLD MAN IN”

INTERVIEW: BURKHARD BÖNDEL, PHOTOS: JUDITH AFFOLTER

2020 has been a tough year of unprecedented events impacting businesses around the globe. In this interview, we ask CEO Stefan Scheiber how collaboration, communication, and a clear plan for the future will strengthen the company, ensuring that along with the safety of our employees, our customers will always be our focus.
Stefan, for nearly a year we have been experiencing the most severe global economic crisis since World War II, according to the head of the United Nations. But before we look at the health of our company, how are you, and how are Bühler’s employees?

As we realized that this virus will turn into a global pandemic, we defined five priorities that would define the key drivers for our company. The first one was to ensure the safety of all our employees. To keep them safe – as well as the personnel of our customers and partners – we have implemented all sorts of measures at all Bühler sites globally. This proved to be very effective.

We have kept the number of infected employees globally under control. Only a few employees developed strong symptoms, and thankfully, we have not suffered any fatalities. Our global Health & Safety organization worked really well, and the global management team personally led the processes; this was very important for me.

To your question about myself: My family and I are fine, thanks for asking. As for Bühler, we are doing quite well considering this tough environment in the B2B capital investment goods business. While our volume has decreased, with diligent management of our global supply chain and our decentralized network, we have been able to serve our customers throughout the challenges. Furthermore, it was vital for us to remain creative, agile, and innovative. As a consequence, we continued driving our innovation roadmap, and we generated creative solutions to prepare for the “new normal”.

Can you give us a few specific examples?

From day one, securing the supply and service chain was key to maintaining delivery schedules for our customers. We found solutions for all of the challenges that we faced thanks to our global production network of 33 factories. Our concept of “in the region, for the region” proved to be very robust. With positive mindsets, creative thinking, and by continuously adapting, we were able to honor all our contracts and never be late.

What about customer service?

We benefited from our nearly 100 service stations across the globe, as well as from our standardized processes and digital platforms, such as myBühler.

Just one example: when the coronavirus first began sweeping across Europe, the situation in Lombardy in northern Italy was bad. The region was completely locked down. Travel even between the north and the south was impossible. To serve our customers there, we immediately reached out to authorities to gain special permission to travel to certain regions and we received confirmation due to our company’s relevance to the food supply chain.

In cases where we supported customers on site, the teams always wore protective equipment, maintained appropriate distance, and adhered to hygiene procedures. No matter the situation, we looked for solutions to always be there for our customers. And our customers appreciated that immensely, as many of them, being food producers, needed to keep production up under all circumstances.

And when travel was absolutely not possible?

We switched to digital solutions. In the past, we had never considered that we could commission a mill remotely, but in April we did just that. Just one of many examples: We commissioned a large wheat mill in Ivory Coast from Switzerland using modern communication technology.
With these systems, everyone was updated about the progress and the next steps on a daily basis. Local service technicians supported the process and the customers’ operators on site. Eventually, we received the first picture of a baked baguette that had been made from the freshly produced flour from that mill. This is just one example of how, in a very short time, we have learned to carry out very demanding technical work remotely. This, of course, will continue to be very important in the future.

Having built up this experience, will you go back to the old routine once it’s possible again?
No, not at all. We learned to provide services to customers with modern technologies and to provide support online and will apply these procedures wherever meaningful. In doing so, we have combined the advantages of the digital world and the physical world in an ideal way, and can be much faster, more agile, and still provide Bühler quality.

How have all the restrictions changed our communication with customers?
My personal feeling is that one can still not fully substitute personal meetings with virtual meetings. At the same time, also when communicating with customers, we have, of course, used virtual technologies much more, and it works. Before the pandemic, physical meetings were the standard. Now virtual has taken the lead. I hope that eventually we will be able to run communications much more effectively, potentially in smart, hybrid ways.

So it is not either or, but both ways of communications have their pros and cons, and it depends on what you want to achieve?
Exactly. And if you do not see virtual simply as a poor substitute for the physical, and if you avoid aiming to return to the old procedure as fast as possible, you will be able to explore a whole new world of communication and collaboration with fantastic possibilities.

For example?
In May, we organized our first Bühler Virtual World, as a digital alternative to the Interpack trade show in Düsseldorf, Germany, which could not take place. Visitors could experience our 3D solution space, attend a content-rich live program, and enter one-to-one sessions in our virtual conference zone. Our customers discovered that these virtual meetings could be structured in completely different ways. For instance, for parts of the meetings, customers brought in experts from different sites. Some meetings had over 50 participants and lasted three hours with different experts taking part to learn more about specific topics. The feedback we received from our customers was overwhelming. And by the way: These digital events are much more sustainable, as we don’t travel. We have calculated that the first Bühler Virtual World has saved around 10,000 tons of $\text{CO}_2$, equivalent to planting about 175,000 trees.

Will trade shows disappear, because face-to-face communication is becoming less vital?
In my view, trade shows as platforms for market introductions of innovations have come to the end of their life cycle. The way people generate informa-
tion and knowledge about new things has changed dramatically over the last 20 years. In the digital age, information is available anytime. The world is moving faster than ever, much faster than the rhythms of classical trade fairs, which are held every two to three years. At this breathtaking pace, industries are also changing faster as market participants are learning to adapt in much more agile ways.

It is not that personal communication is less important, but rather that digital is a thousand times more efficient and effective when it comes to trade fairs. However, face-to-face meetings will remain important or become even more important to build up and maintain personal relationships.

I expect very powerful new concepts in the future, where events combine the physical and virtual worlds. There will be new exciting options. Waiting for the supposedly good old times where trade fairs will come back in the traditional way is most probably not the best recipe going forward.

**So what is Bühler’s recipe for resilience and future success?**

It is about purpose, people, and innovation. Passionate people who collaborate in a global network, driven by a joint purpose, will make the difference. These people will realize that they need to have diverse skills and capabilities to shape the solutions for the future as conditions in the markets rapidly change. They will also realize that they will not find all the answers they need within their organization, and will reach out to partners to collaborate.

**Let’s talk about our global network. Why is that a success factor for Bühler?**

Our global network works as a risk mitigation instrument. Take our nearly 100 service stations. In all key regions globally, we have built up these service stations with qualified engineers and original spare part warehouses. As a result, we were always up and running even during the extensive lockdowns earlier in the year. Even when travel is restricted, our people can ensure plant and equipment availability and project execution. The same is true of our decentralized production network. We can balance and level out fluctuations and overcome critical situations. To be locally relevant, but globally leveraged has become an immense advantage for us.

**What about leading solutions and technologies, and the respective price?**

Well, we are fully aware that price is important, but it is not the only criterion. Price is one important part of the equation and must be considered in the context of value creation. With our solutions, we offer customers competitive advantages because we master complete value chains. All of our new products and services are measured against the value they create for our customers, in each and every segment in which we are active. Over and above of this, all our new solutions must contribute to our sustainability goals of reducing waste, energy, and water, in our customers’ value chains by 50 percent, and creating more out of the sidestreams. All our solutions provide the advantage of integrated automation and connectivity. This is part of the Bühler culture.

**What does culture have to do with all this?**

My belief is that resilience and success are the result of a culture that rewards and encourages individual behavior. We invest a lot into lifelong learning, education, and innovation. And we are guided by our strong values of trust, ownership, and passion – they are our lighthouses.
Please elaborate.

Leadership at Bühler means turning purpose into reality. Every day. In everything we do. Effective leaders create a culture of trust, ownership, and passion and they ensure that their teams follow suit.

Our purpose is our uniting factor, across geographical and organizational borders. Our purpose is to innovate for a better world. For this, we stand united, internally, but also with our customers, suppliers and partners. I am convinced that this will create more value over time. This year, Bühler is celebrating its 160th birthday. I cannot imagine a better reason to do everything in our power to continue shaping the future. For our customers. For our partners. For ourselves.

Have you ever been afraid in the past months?
Yes. I have to admit, there were sleepless nights. This crisis is taking us to our limits and sometimes even beyond. It would not be authentic to deny this. The question is what you do with it. Do you allow fear to take control? Or do you accept fear as a motivator which you turn into positive momentum?

I look to Nelson Mandela, who said: “I learned that courage was not the absence of fear, but the triumph over it. The brave man is not he who does not feel afraid, but he who conquers the fear.” But there is more to this: In many cases, humans, like companies, can develop a tendency to retract, to hold on to what they have, and generally, to step on the brakes. This is very normal, and surely also necessary when the going gets tough. However, I feel it is important to remain open enough to allow for creativity, for new ideas, and for new ways forward.

I found inspiration in a story which touched my heart. One day, country and western singer, Toby Keith, was playing golf with Clint Eastwood, the famous actor and director. At one point, Eastwood said to Keith, “I turn 88 on Monday.” Keith asked, “What are you going to do?” Eastwood replied, “I am going to shoot a new movie.” Keith asked him, “What keeps you going?” Eastwood answered, “I get up every day and I don’t let the old man in.”

My personal recipe is to keep on going. Keep on creating. And also in times of adversity, never let the old man in.
Samuel Schär, Chief Service & Sales Officer for the Group and CEO Advanced Materials, and Tjark de Vries, Head of Global Customer Service, are passionate about Bühler’s new approach to customer service. In the CUBIC, they are having a socially-distanced discussion about supporting customer success.
Our customers have always been at the heart of our culture, and this year in particular has shown that close relationships are vital – even more so in times of crisis. To further strengthen our collaborative approach, Bühler is setting up a new framework of service offerings comprising classical and digital services, which not only focuses on single service interventions, but also looks at the long term in the form of performance and outcome-based services.
THE AIM OF BEING CLOSE to our customers has driven Bühler for 160 years, and this year, more than ever, the importance of customer proximity has moved to the forefront. Our global setup, based on the principle of “in the region, for the region”, has been proving highly valuable throughout the coronavirus pandemic, which has thrown new challenges into the paths of businesses around the world since the start of 2020. Our presence in over 140 countries, with nearly 100 service stations globally, enables us to be there for our customers even during the most challenging times, but physical proximity is just one aspect of customer service.

Understanding the challenges our customers face has led Bühler to make decisive steps towards providing an even more customer-centric approach in its service offerings. “We believe that service is the most important driver to influence the success of our customers. And we can only be successful if our customers are successful,” explains Samuel Schär, Chief Service & Sales Officer for Bühler Group and CEO Advanced Materials. “In concrete terms, it means that we want to be even closer to our customers, be it physically, having an even stronger presence in the local market, and also strategically, working in close collaboration with their operation and business teams. With our long-standing experience as an innovative engineering and technology company, we have the know-how to support our customers beyond just maintenance.”

With this new approach, Bühler aims to help customers shrink downtimes, be more efficient, and increase the sustainability of production sites by reducing waste, water, and energy consumption. Another objective is to lower operational costs, thereby achieving higher overall profitability.

Introducing TotalCare
The first element of Bühler’s new service strategy is TotalCare, a framework for inspection and maintenance services. Within this framework, we work together with our customers’ teams to define the range of services needed. This gives us the ability to build a customized service package, designed to enhance performance and maximize profitability (see text boxes for the package options).

Still in the making, but soon available, is our RemoteCare package which will offer various options for remote support in all areas of expertise. Going a step further, Bühler will establish Customer Operations Centers around the globe. The first, based in Switzerland, will soon open. In these centers we will bring together the power of Bühler Insights and RemoteCare. In addition to the reactive support, Bühler industry experts will monitor events happening at customers’ plants and proactively provide recommendations – before problems cause greater harm to the customer’s operation.

“Over time, we know that every asset in the field will at some point no longer operate at its maximum performance capability. That is where we come in. Together with our customers, we will take actions to retain and even improve the performance of the customers’ operations facilities. This means we need to
better understand how the machines, the plants, and the lines are operated and maintained,” explains Tjark de Vries, Head of Global Customer Service. “We want to jointly learn and improve, and to do this we need to have our customers’ best people and Bühler’s best people at the table. It is about close collaboration and co-creation.”

The power of digitalization

Going forward, Bühler’s global service business will also integrate all of the digital solutions that are being developed. These digital services will make it possible for our customers to collect meaningful data from their plants and convert this data into valuable insights. “Bühler’s goal is to be a true partner, not just a technology provider. By combining digital insights with traditional services we will make sure that our customers get the most out of their investments throughout the entire asset life cycle,” says de Vries.

Today, with the base functionality of Bühler Insights, customers already have the option of visualizing data through dashboards, and they can access and follow up on information which wasn’t accessible in the past. Bühler Insights is Bühler’s Internet of Things (IoT) platform, which makes it possible to collect, correlate, and visualize data from Bühler machines and plants as well as other equipment manufacturers.

It is possible to build on to the base functionality of Bühler Insights with more specific products. Replay, for example, makes it possible to “turn back time” on a customer’s automation solution in order to understand what happened in the past. Or, one could add the Pellet Mill Companion, a service which combines digital connectivity, dashboards, and a monthly call with an expert, where the insights are discussed and converted into operational improvements. “When we act based on these insights, we can create tangible benefits for our customers,” explains de Vries.

INSPECTCARE

InspectCare includes regular inspections of your machines by Bühler’s specialists who, at appropriate intervals, assess wear and tear, and recommend the appropriate maintenance actions and parts to have ready for maintenance. The aim is to identify risks and possible issues and to support decision making to ensure the continued, efficient operation of your equipment.

The aim of the inspecting service is to ensure that wear and tear and potential issues are identified before they lead to machine downtime and lost productivity. The inspections are typically performed at regular intervals, such as every week, month, or year, depending on the specific needs of the machine and its usage.

MAINTAINCARE

In addition to inspection, our highly-skilled technicians carry out the respective repairs and preventive maintenance on the covered equipment. Executing the maintenance with Bühler ensures a high quality result and that the equipment recovers lost performance and runs at the best possible capacity following the maintenance event.

MAINTAINCARE PLUS

In addition to MaintainCare, this package also provides the necessary high-quality parts to complete maintenance activities. Bühler ensures the maintenance event is planned, prepared and executed from a single source. Surprises and risk of excessive wear of parts can be effectively mitigated.

FLEXCARE

FlexCare combines the best of all worlds for a highly customizable service delivery. Choose one of the three service modules as a basis and then select the optional features from the modules that best suit your needs.

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Going forward, Bühler is also introducing new models for service delivery. For example, traditionally we were guaranteeing our own performance, but in the future we will also work jointly with our customers to develop models where we guarantee certain outcomes in operations. “In essence, we will help our customers bear some of the risks of their business. This represents a new level of collaboration. We will partner with our customers in a much more entrepreneurial way instead of just supplying what they need,” Schär explains.

Sustainability at the center
At the Networking Days 2019, Bühler announced its sustainability targets: To reduce waste, water, and energy consumption by 50 percent in our customers’ value chains. In the new era of customer service, these targets also play a huge role. “The industry has realized that we are using the resources of this planet as if there were almost two planets available. In addition, by 2050 we will have a world population of 10 billion people. This is a massive challenge for all of us and we have to take up responsibility and act accordingly,” says Schär.

Bühler is committed to developing solutions with its ecosystem of partners that will be ready by 2025. These solutions will reduce the energy, water, and waste footprint in our customers’ value chains by 50 percent. Bühler’s installed assets in the market – this includes machines and production lines that have already been running for 5, 10, 20 or more years – is huge.

“The biggest lever to achieve our sustainability target are the existing assets of our customers. We are committed to bringing new expert services and solutions to the market, which will help our customers operate more sustainably. And it is clear that these solutions also need to be economically viable,” says de Vries. “Reducing waste, water, and energy consumption means cost savings in operations, so we are convinced that this is an important and feasible way to go. Together we can make a quantum leap towards more efficiency, sustainability, and in the end achieve a better outcome.”

“WE BELIEVE THAT SERVICE IS THE MOST IMPORTANT DRIVER TO INFLUENCE THE SUCCESS OF OUR CUSTOMERS – WE CAN ONLY BE SUCCESSFUL IF OUR CUSTOMERS ARE SUCCESSFUL.”

SAMUEL SCHÄR
Chief Service & Sales Officer for Bühler Group and CEO Advanced Materials

YOUR BENEFITS

+ Better equipment performance
+ Mitigation of operational risks
+ Maintenance cost control
+ Protection of asset value
+ Fast and efficient service interventions in case of breakdowns
+ Reduction of Total Cost of Ownership
+ Increased revenue through better equipment reliability

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TJARK DE VRIES
Head of Global Customer Service, Bühler

WORKING ON THE BASICS

Naturally, we have also strengthened our team to further work on the basics. For example, our spare parts business has grown in efficiency and professionalism with the implementation of a global supply chain network and a reengineered spare and wear parts process. This enabled us to establish the myBühler customer platform, which has each customer’s installations at the center, enhanced with product documentation, an e-commerce module for parts ordering, with many more features to come. On the field service side, Bühler is becoming even more flexible in terms of local manpower availability. Alongside our local teams and experts in our service stations worldwide, Bühler works with BenLink, a start-up company founded and owned by Bühler. Through their online platform, BenLink offers base-level service packages, such as roll exchanges or the exchange of filter sleeves cleanings. Professionals from the open market are being trained and certified on the BenLink platform. Currently, BenLink is building a network of thousands of technicians worldwide, while the start-up operates very close to our customers’ sites, making sure the service is delivered in the leanest possible way.
WHEN SPEED SAVES LIVES

TEXT: ANJA METZGER
PHOTOS: STUART DUDLESTON
In March, just when the coronavirus pandemic had begun to hit Europe hard, MRT Castings was faced with an urgent demand for more parts to produce critical care ventilators. Only an additional die-casting cell could drastically increase production and MRT couldn’t wait months for the machine to be built and shipped. Together with Bühler, the team managed to get a new cell up and running in just five weeks.

In the early stages of the coronavirus pandemic, hospitals were desperate for equipment – not only personal protective equipment, such as gloves, masks and gowns needed to protect medical staff, but also high-quality medical ventilators for patients. These are needed to ventilate Covid-19 patients when their lungs cannot get enough oxygen into their blood. Expecting rising numbers of severe cases, hospitals all over the world were gearing up for more critical care beds. With this race against time, well-known companies such as Ford, GM, Toyota, and Tesla pledged their support by converting a portion of their sites to manufacture such devices. However, ventilators are complex units that, as medical devices, are produced under a tight regulatory regime, as the units must work reliably. Building a complete supply chain and getting the official approvals takes time. Time the hospitals and the patients didn’t have.

A faster way was for existing manufacturers to produce more ventilators and rely on their known suppliers. In mid-March, the manufacturer MRT Castings in southern England, took up the baton in the race to help produce the much-needed ventilators. Their largest customer had called them with an urgent request to increase production five-fold for die-cast parts they were already producing. MRT manufactures 19 parts for ventilators that are then assembled by their customer and shipped worldwide. “When we got the request, we had just finished building a new production hall for future growth and were moving in one of our existing die-casting cells,” says Phil Rawinson, Managing Director of MRT Castings.

So space was not an issue, but production capacity was. “Our new die-casting hall was constructed to accommodate additional capacity in the future, but we expected only to relocate existing machines initially, then add additional machines in later years. Covid-19 changed that plan immediately, and we had to come up with a fast solution in order to play our part in this pandemic response,” explains Rawinson. He spoke with Jeremy Mitchell, a Bühler service engineer who was on site to support the move of the existing machine and asked him how quickly Bühler could deliver a new die-casting cell. If Bühler could deliver tomorrow he would buy it immediately, he told Mitchell. “Initially, I was joking,” says Rawinson. “But then Jeremy said, ‘Let me check.’”

A bit of luck and trust
It takes about four months to produce a die-casting machine of the required size – too long to make quick difference in this challenging market. “There was an audible sigh on the other end when I told the customer about this manufacturing timeline on
the phone,” Rawnson recalls. But Jeremy Mitchell wasn’t ready to give up and promised MRT that he would look for an alternative solution. After a few calls, it became clear that Bühler had a suitable machine, an Ecoline 53, in stock in Switzerland that could be delivered quickly. “For emergencies, such as fire damage or complete breakdown of a machine, we find quick solutions, and we sometimes have a small stock of machines available,” says Mitchell.

The availability of the machine with the perfect specifications was sheer luck: there are numerous different applications for die-cast parts, and MRT produces parts for medical devices as well as the aerospace and automotive industry. Depending on the size and the complexity of the parts, a different machine is needed. Also, the tooling – the custom-built form into which the molten metal is shot – had to fit the machine.

Mitchell knew exactly what was required and the machine in Switzerland fitted the bill. “It takes a good and long-lasting customer relationship to be able to judge our requirements so quickly,” explains Rawnson. MRT and Bühler have been working together for 20 years.

1,000 different components
Components for the medical industry must meet high standards and strict approval processes. Not only do the parts have to be very precise and repeatable, but cosmetic aspects are also important. Unlike a motor block hidden in a car, for example, a lot of the parts for medical devices are visible in the finished product and therefore need to have a perfect surface finish. The critical care ventilators into which MRT’s parts are incorporated, are complex high-tech units: the ventilator is housed in a robust trolley to be located at the patient’s bedside, complete with a touchscreen monitor. Some models even come with their own compressor and independent power supplies, to enable them to operate while patients are being moved around the hospital. Such a unit consists of over 1,000 different components, supplied from 14 different countries, which makes for a very complex supply chain. And changing one supplier in the chain means going through approval processes again. MRT’s customer was therefore relying on them to come up with a solution for these essential die-cast parts. When MRT realized that

“EVEN WHEN THE PANDEMIC PASSES, HOSPITALS WILL BE EXPECTED TO ENSURE THAT THEY HAVE ENOUGH CAPACITY TO MEET INTENSIVE CARE VENTILATOR NEEDS.”

PHIL RAWNSON
Managing Director at MRT Castings
Bühler could provide the right machine for the job in such a short time frame, their decision to invest was easy. It took just five days to discuss and sign the contract. “Even when the pandemic passes, hospitals will be expected to ensure that they have enough capacity to meet intensive care ventilator needs. We therefore expect the elevated demand for these castings to continue for at least 18 months, and thereafter, the Ecoline 53 is a versatile machine which provides additional capacity for us in all market sectors. This made it worthwhile for us to invest in the capacity increase,” Rawson explains.

United by purpose
One week after the order, the Ecoline 53 had traveled over 1,000 kilometers by truck from Switzerland to England and arrived at its destination in Andover. “Our customer could hardly believe that things were moving so fast, so I sent them pictures to prove it,” says Rawson, laughing. The Ecoline was placed in MRT’s new production hall where Bühler service engineers started assembling the machine immediately. “We worked in pairs on the machine, one on each side, so that we could maintain the required Covid-19 safety distance at all times,” Mitchell explains.

Accommodation was also a challenge. At the beginning of April, all hotels around Andover were closed due to the coronavirus lockdown. So every evening, after a long work day, the service engineers drove two hours home in separate cars. “Everybody went the extra mile and worked a lot,” Rawson recalls. “But the urgency of the matter brought the MRT team and the suppliers together. We knew why we were doing this. We were united by purpose.”

500% more parts
It really was a team effort. While the new die-casting cell was being assembled, MRT took delivery of four new CNC machines from a different supplier. This ensured that the additional parts manufactured on the new Ecoline could get the finishing touches needed for medical applications. MRT switched to a 24-hour shift operation and recruited 20 additional employees from nearby companies where the workload had dropped due to lockdown.

Only five weeks after the initial request, MRT was able to claim they had achieved the impossible – they had increased capacity by 500%. “Since April 22, we have been producing at full speed on the new machines,” Rawson proudly states. Five hundred sets of the 19 parts needed for a critical care ventilator now leave the factory every week. MRT’s customer was impressed. “Because we responded quickly, we could give them continuity in their production and accelerate the process by months,” says Rawson. “The exceptional collaboration with Bühler made this possible, so our supplier helped us to be a better supplier.”

Although the installation was short-notice, the investment will be long-term for MRT. “The new machine not only guarantees the reliability and continuity we are looking for, but also makes us future-ready,” Rawson says. The Ecoline is IoT capable, with all the peripherals connected, including extractor robots, die spray, robotic ladler, and temperature-control units.

In addition to helping save lives during the pandemic, the urgent investment marks the first building block of the future production in MRT’s new hall. “The Covid-19 pandemic has accelerated our move into the new die-casting hall, and our investment in world-class new die-casting technology,” Rawson explains. “We’re excited about the opportunities which this technology, and our partnership with Bühler, can bring for our continued growth.”

Phil Rawson, Managing Director at MRT Castings, and Jeremy Mitchell, Sales Manager at Bühler, in front of the new die-casting cell.
MAKING A MEAL OF SOCIAL MEDIA

FROM #UNICORNPIZZA TO #SUSTAINABLEFOOD

TEXT: JANET ANDERSON
Social media is making its impact felt in the food industry, driving trends and changing the shape of consumer demand. New products, new ingredients, new food ideologies – is it possible for industry to keep up with the rapid changes? We look at the nature of this phenomenon and how, by embracing social media, industry can help to create a healthier and more sustainable food system.
HAS INSTAGRAM CHANGED the way we eat? It’s a justifiable question. Food is one of the most posted subjects on social media. Bloggers, influencers, and millions of users drive trends every day, from rainbow bagels and unicorn pizzas to monstrous burgers and crazy-looking shakes. With 1.1 billion Instagram users, 416 million on Pinterest, 145 million daily users on Twitter and 2 billion on YouTube, the scope for influence is vast – and that is without even mentioning Facebook’s nearly 2.7 billion users.

With all this online activity, it might seem as if people care more about what their food looks like than anything else. But that would be far from the truth. Engagement in the topic ranges from aesthetics to nutrition, sustainability, and ethics. Among the posts from friends, strangers, celebrities, and influencers sharing their favorite foods, recipes, and restaurants, there are also nutritionists, dieticians, and chefs sharing their knowledge, and activists raising awareness of food-related issues.

How is social media changing our relationship with food and what effect is that having on the food industry? Is it driving trends that are unsustainable, or could it be a force for good?

One person watching this phenomenon is Tanja Schneider, sociologist and Associate Professor of Technology Studies in the School of Humanities and Social Sciences at the University of St. Gallen in Switzerland. Between 2013 and 2016 she was Research Fellow at the University of Oxford and part of an interdisciplinary research team in the Anthropology Department, funded by the Oxford Martin Programme on the Future of Food, which looked into the connection between new information and communication technologies and food.

The team published their findings in a book called “Digital Food Activism”, which investigates how digital media technologies are transforming consumers’ engagement with food, eating, and food systems and the potential of this to reshape the ethics, aesthetics, and patterns of food consumption.

“DIGITAL MEDIA HAS NOTICABLY CHANGED OUR RELATIONSHIP TO FOOD,” Prof. Schneider explains. “FOOD IS NO LONGER JUST ABOUT EATING; IT IS ALSO ABOUT REPRESENTING THE ACT OF EATING AND SHARING IT IN REAL TIME. FOR SOME, THIS HAS BECOME A NEW RITUAL.”

Food photography on social media is very much about aesthetics and self-expression, but it also has a powerful effect on markets. Chefs are adapting how they present their meals to make them more photogenic, and restaurants are even being designed with Instagram in mind, says Prof. Schneider. Even if there is evidence of a backlash with some chefs saying they would like diners to spend time enjoying their food rather than photographing it, the trend is unlikely to go away.

“WE FOUND THAT IT IS IN THE INTERACTIONS BETWEEN THE ENTREPRENEURS, THE CONSUMER-CITIZENS, THE PRODUCERS, AND THE RETAILERS THAT NEW KINDS OF FOOD ACTIVISM ARE EMERGING.”

TANJA SCHNEIDER
Sociologist and Associate Professor of Technology Studies, University of St. Gallen, Switzerland
“The use of social media around eating does not replace the visceral experience of eating; it is added on and merged with it,” explains Prof. Schneider.

Social media is also driving changes in how consumers perceive the value of food. It acts as an amplifier for information about the health, sustainability, and ethical and political issues around food products and companies. The result is that people who in the past might not have asked questions such as, “Does it contain palm oil?”, “Where was it grown?”, “How were the animals reared?”, or “What is the name of the parent company behind this brand?”, are today more likely to at least be curious about these issues.

**Everyone is part of the conversation**
The digital space enables people to express concerns, exchange information, and join the conversation more easily. It is also easier today to find like-minded groups. “In the past, as a vegan in a small village, you might have been the only one. Now you can go online and find that there are a lot of others. That reinforces your resolve and inspires you,” Prof. Schneider says. “Food has always been a popular topic in the media, but whereas the majority of people were passive onlookers, now everyone can actively contribute to the conversation.”

The growth in popularity of veganism is a good example of how social media is driving change. Veganism used to be a tiny niche. Now supermarkets offer a wide range of vegan products in all forms and varieties. It begs the question: would veganism have gone mainstream without social media?

The number of people declaring themselves to be vegan is still relatively small, says Prof. Schneider. However, its visibility on social media channels has meant that more are aware of veganism, have become interested and may even decide to try it out. “This is interconnected with the fact that we have seen more chefs publishing vegan cookbooks and companies launching vegan product lines. Where it starts and ends is hard to say, but social
One of the key concerns that runs through much of the digital food activism is the demand for more transparency. Consumers are not just interested in the ingredients in products and their environmental impact, they are also seeking transparency from food companies in the way they market their products, in their communication about their production processes, and in their communication about corporate ownership structures and political lobbying.

“We are seeing growing interest on social media in how food is produced, distributed, and consumed, and how it can be made more democratic, sustainable, healthy, ethical, and better in quality,” says Prof. Schneider. One example that she and her colleagues studied was the US app Buycott, which encourages users to vote with their wallet and boycott certain products while supporting more sustainable alternatives. “We found that it is in the interactions between the entrepreneurs, the consumer-citizens, the producers and the retailers that new kinds of food activism are emerging,” she says. “Digital and social media have disrupted the power relations within the conversation. Now everyone can take part and even drive it.”

An opportunity for industry
Social media represents a challenge for industry, but also an opportunity for both industry and the consumer, thinks Prof. Schneider. It enables consumers to enter a dialogue and have an impact, and it allows companies to bring the consumer in earlier in the creation of a product. “Social media enables businesses to be more aware of the issues earlier on and bring them on board. It allows for new models of consumer-driven innovation. New spaces are emerging for experimentation, depending how open both sides are to engage in dialogue,” she says.

This optimism is shared by Emeline Fellus, Director of FReSH, the Food Reform for Sustainability and Health project run by the World Business Council for Sustainable Development (WBCSD). She is also one of the authors of “Consumption, Behavior and Trends”, an insight report published by FReSH that aims to provide a critical understanding of what consumers want and why.

The growing role of social media is one key area of focus of the report. But the aim of the report goes far beyond understanding this phenomenon. The intention is to use this understanding about trends and behaviors in food consumption to address one of the biggest challenges the world faces: The fact that our current global food system is unsustainable, unequal, destabilizing, and unhealthy. Understanding the drivers of consumer demand is essential if we are to build a better food system. “We know that people around the world have very different types of diets, but we have identified some mega trends that...
are common to many countries,” explains Fellus. The report showed that people in most regions are eating more convenience food and, as they earn more money, moving toward a Western diet. That means they are eating more animal protein, more processed foods and less fruits and vegetables — a diet that tends to be less healthy than traditional diets as it is higher in sugar, salt, and trans fats and lower in fiber and nutrients. However, the report also showed that there is a trend in many places toward a healthier and more natural diet.

The food industry can encourage the healthier and more sustainable trends by understanding how people make food choices and meeting the consumers where they are. A lot also depends on communication and presentation. “The narrative makes a big difference,” says Fellus. “Industry is not alone in defining the narrative. Bloggers and social media influencers also help shape the narrative around what constitutes a healthy and sustainable diet. But big brands still have influence. It may be that they no longer initiate as many trends, but they still have the power to amplify them — and that’s the role they should play in helping to promote healthy and sustainable choices.”

A trusted source
The biggest challenge for companies is getting the right message across when there is so much noise and growing distrust. According to the annual “Edelman Trust Barometer”, which measures trust in different stakeholders, people are displaying growing distrust in big groups, whether they be governments or corporations, and are increasingly relying on social media. This applies to food choices, too.

In France, for example, an app launched in 2017 to help consumers make good food choices has been a massive success. Yuka allows users to scan barcodes and receive detailed assessments of the health value of individual products as well as proposals for better alternatives. The app has been downloaded over 10 million times. Crucially, it was developed by a group who are independent of any government or corporation. “One of the guys in the group simply wanted to know which products were best for his children,” says Fellus. “People are increasingly relying on what this alternative view tells them about what is healthy, rather than what is on the front of the package.”

Yet, with all the information available to consumers, there is still a danger that consumers gain only a partial understanding of an issue. “Nutrition is a highly complex area,” explains Fellus. “What companies need to work on is offering the best information alongside trustworthy products. Labeling is one part of this, but it is also really about education and leadership.”

Changing the narrative about what we eat is important in driving beneficial changes, as is providing trustworthy information and making good food choices both easy and appealing. However, there is a wider dimension. “Eating is not just about feeding yourself. It should also be about your relationships to other people, your family, and nature,” Fellus explains. “This is where social media can play a beneficial role. The millions of people who post pictures of themselves enjoying a meal with friends are helping to revive our sense of what food is all about.”

“INDUSTRY IS NOT ALONE IN DEFINING THE NARRATIVE. BLOGGERS AND SOCIAL MEDIA INFLUENCERS ALSO HELP SHAPE THE NARRATIVE AROUND WHAT CONSTITUTES A HEALTHY AND SUSTAINABLE DIET.”

Emeline Fellus
Director of FReSH (Food Reform for Sustainability and Health)

INFO
FOOD IS COOL

During his keynote speech at the 2019 Networking Days, Nestlé’s Chief Technology Officer, Stefan Palzer, explained that food plays a big role in Insta-content. “Whether they are celebrating indulgence or advocating strict diets, the explosion of food tribes on social media proves one thing: food is cool among the younger generation. Novelty, variety and excitement are important for them as they share their experiences online. We now talk about the Instagramability of our offering. And we see food ideologies growing online that create demand for new food categories, like grain-free pizza where the dough is made entirely with cauliflower. We need to innovate to address these consumer trends. That brings complexity to our business, but it also brings plenty of opportunities.”
Miller Milling has transformed into one of the world’s most digitally advanced milling companies in a whirlwind year. With a vision to lead the evolution of the milling industry, grow their business, and contribute to a sustainable society, the company embarked on its journey to harness the potential of connectivity.

It was the power-generating potential of the St. Anthony Falls – a natural waterfall on the Mississippi with a 15-meter drop – that attracted the first flour millers to Minneapolis, Minnesota, nearly 200 years ago. Minneapolis soon became home to some of the most advanced milling technology of the time, experiencing a golden age from 1880 when the city was known as the “flour milling capital of the world” for over 50 years. With such heritage, it should not come as a great surprise that Miller Milling Company, founded in 1985 and headquartered in Bloomington, just outside Minneapolis, has picked up the technological baton to become one of the world’s most digitally advanced wheat milling companies.
Miller Milling is the fourth-largest wheat miller in the United States, producing quantities ranging from 25-pound bags to bulk railway cars of bread-and tortilla-flour as well as durum semolina for pasta. With 13 milling units based in five plants across America, the first step of its ongoing digital journey was taken in May 2019 when Miller’s senior managers met with the Minneapolis-based Bühler team to discuss trying to streamline their reporting systems across their five plants. No one knew then that the conversation would be a transformative moment in Miller Milling’s history. “In less than a year, we went from an initial conversation with the customer about how they report their key performance indicators, to linking up and streaming data from all of their 13 milling units, with Bühler Insights, myBühler, and Mercury MES,” says Liam Cassidy, Head of Automation at Bühler North America, who, along with his colleague, Sales and Account Manager Juan Martinez, helped manage the process. It is the first time that multiple plants have transitioned to Bühler’s totally digital solutions in the US.

Developing IT to reach a global vision
The global flour milling industry is a traditional sector that for generations has been content to create its products in time-honored fashion. However, for Miller Milling there were two factors driving change.
In 2012, it was bought by the Japanese holding company Nisshin Seifun Group, which also owns Nisshin Flour Milling, Japan’s largest flour miller with ambitions to become the world’s number one flour milling company in regard to customer satisfaction.

“Nisshin Group, the parent company, and Miller Milling believe IT adoption in the milling industry is far behind other industries and we will only be able to grow a successful business and contribute to a sustainable society by developing IT,” explains Daisuke Ito, Miller Milling Director of Engineering. “So, in reality, if we wish to reduce energy consumption and waste while producing a stable, high quality, and safe product for our customers, there is no other option than to develop the IT technology.”

The other driver came from the market. Environmentally aware and health-conscious consumers are increasingly alert to the provenance of their food, which means Miller Milling’s clients are demanding ever-greater transparency and auditablety of their products. “Food safety, traceability, and sustainability are all being pushed by our customers, so we have to move forward and keep up with these changing demands,” explains Jeff Hole, Senior Vice President of Operations at Miller Milling.

As negotiations unfolded, a synergy began to form between the two teams as they realized the potential of being able to digitalize and analyze any part of the production process where it was possible to place a sensor. “We came together and formed a single team, an ecosystem, where we set common goals by breaking down the walls that exist between customer and supplier. So we said, ‘Let’s get connected and get your data flowing and then let’s develop systems together,’” explains Cassidy.

Meanwhile, the Miller Milling management team was invited to Switzerland to attend the Bühler Networking Days event in August 2019, where Bühler announced its ambition to have solutions in place to
cut energy consumption, water, and waste by 50 percent in its customer value chains by 2025. As the owner of one of the only mills in the United States to generate 15 percent of its energy requirement from its own solar panels in Fresno, California, it was a message that aligned with Miller Milling’s own corporate ambitions.

When Bühler’s sustainability targets were unveiled, they spoke to Miller Milling’s bottom line and the demands of their customers for greater sustainability, but also to their desire to do the right thing when it comes to climate change.

**A joint sustainability agenda**

“Once you open the digital door there are so many possibilities that open up, and one of them is environmental,” explains Simon Tiedge, Director of Technical Milling at Miller Milling. “For example, we are working on kilowatt meters in all our plants that will feed straight into Bühler Insights so we can see exactly how many kilowatt hours per ton we are consuming every minute, then we will do the same thing with water content, moisture additions, and misused products, so now we will have control of all of our resources minute by minute. It’s not only the speed of reporting but it’s the big overview that will give the user the biggest bang for their buck.”

**VIDEO**

Watch this video that Microsoft made about Miller Milling and its digital journey with Bühler.
The Miller and Bühler teams were on a voyage of
discovery. Once it was apparent that sensors can
measure many different parameters, including
humidity and temperature, the teams started to cap-
talize on new ideas. “The Bühler Insights platform
is growing every day and literally every day we have
a new sensor and a new idea. We just pull in the data,
we record it, and then we start linking sensors and
plants to each other and they start making sense,”
explains Tiedge.

Embracing the potential of new systems
A concern for many companies, especially in more
traditional industries, is how you carry your employ-
ees with you on this transitional journey without
alienating staff or making them fearful of job secu-
rity. Miller Milling decided to turn this concern on
its head by looking at digitalization through the lens
of health and safety. “It’s a little difficult to wrap
your head around it, but we believe one of the key
pillars to Bühler Insights is around our employees
and their health and safety, and in particular their
wellbeing,” says Tiedge.

The first thing the Miller management team real-
ized is that employees lived with complex technol-
yogy in their everyday lives, so the idea of it being
introduced in the workplace was a natural evolution
rather than something to fear. They found that their
operations teams quickly grasped the potential of
the new systems and embraced the new direction for
the company. “The younger generation is used to
doing everything on their phones, so why would they
want to come to work in a place where there was no
technology? If we can invite employees to use their
current knowledge of technology then it helps us
too,” Hole points out.

Staff working in the more traditional, semi-auto-
mated mills are required to do a lot of fairly mun-
dane testing procedures to try to assess quality, often
involving potential laboratory work as well as sam-
pling, resampling, and analysis. “We realized that
this data analysis was not just for management but
for our team members working in the mill, so they
can save a lot of time currently spent on collecting
information. Instead, they can now spend time doing

“ONCE YOU OPEN THE
DIGITAL DOOR, THERE ARE SO
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OPEN UP AND ONE OF THEM
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SIMON TIEDGE
Director of Technical Milling at Miller Milling

INFO

Miller Milling Company, headquartered in Minneapolis, has 13 mills spread over five
plants located in:

* MILLER MILLING CO.
  MINNEAPOLIS | MINNESOTA

* OAKLAND | CALIFORNIA

* FRESNO | CALIFORNIA

* LOS ANGELES | CALIFORNIA

* SAGINAW | TEXAS

* WINCHESTER | VIRGINIA
further data analysis, allowing us to improve efficiency,” explains Ito. Workers also quickly realized that with digitalization they did not have to spend hours not knowing if they were meeting optimal production parameters. Using Bühler’s digital technology, it is possible to get instant results by automating the sampling process using infrared (NIR) technology and other online sensors.

“What we are trying to do is unlock the full potential of our employees by enabling them to improve the process on a daily basis and give them the time to do what they are supposed to do,” explains Tiedge. “By using Bühler Insights we pretty much give them the data they need in the palm of their hand via an app so they can see minute by minute if they are winning or whether they have to improve what they are doing, which is of great value to an employee.”

Under the old regime, plant operators arriving at the plant for a new shift would raise concerns about the time it took to understand what had been happening overnight, especially if there was a problem. With digital data available on mobile phones it is much easier to isolate problems quickly while sharing real time production parameters across all mills, giving operators valuable additional insights.

**Full transparency beyond the mill**

One of the most important advantages of this digitalization is the benefits it brings to Miller Milling’s clients, such as the speed at which data can be transmitted. “With these systems we are able to get data to our clients on order logistics, with the goal of getting this information to them prior to the flour being delivered,” explains Hole. “It means much more timely data for clients, with them being able to receive notifications on when their order is milled, loaded and into which trailer, the time it leaves the mill, Certificate of Analysis information, security seal numbers, and estimated time of arrival.”

But the journey does not end here. Once you open the door to digitalization the direction of travel is set, but, the destination keeps shifting as the technology evolves. Traceability is key to customers and one of the next areas that Miller plans to explore is the ability to trace any specific flour back to the field where the wheat was grown to enable clients to better market their products.

Another area of exploration is logistics. With delivery trucks across the US, digitalization means being able to place sensors to monitor and control every moment of these journeys in terms of the environment in the trailers and predicting exact arrival times. Feeding big data into production systems around predicted weather patterns, climate, and humidity, will also improve capacity for cutting wastage. “We don’t know what is going to happen next in the tech world, so we have to keep our eyes wide open and look outside our industry to other sectors that may be picking up on stuff before we do. But for us, the focus will always be on three pillars: sustainability, customer satisfaction, and the benefit to our employees,” says Tiedge.
The food industry is undergoing a major transformation. Awareness among consumers and society is growing that our current food system is not sustainable and this is driving new choices and trends. New ingredients, products, and business models are emerging, and food producers need to get ahead of these changes. We are ready to help our customers explore and embrace the future of food.
ARE YOU READY FOR CHANGE?

HEY, FOOD INDUSTRY!

TEXT: JANET ANDERSON, PHOTOS: THOMAS EUGSTER

#FUTUREOFFOOD
“WE ARE WELL CONNECTED WITH OUR CUSTOMERS. WHEN THEY BRING US THEIR QUESTIONS AND PROBLEMS TO SOLVE, WE GET AN INSIGHT INTO WHAT IS DRIVING THE MARKET.”

DR. BÉATRICE CONDE-PETIT
Head of the Bühler Future of Food Program

How will we nourish 10 billion people well by 2050 while protecting nature and limiting climate change at the same time? That is the big, burning question,” says Dr. Béatrice Conde-Petit, Head of the Future of Food Program at Bühler. “We are at a crossroads – we need to promote people’s health and wellbeing, but we must do so in the most sustainable way possible. Business as usual will not do the job.”

The challenges facing our food systems are as serious as they are now familiar. In the news, on social media, in kitchens, restaurants, and supermarkets, there is growing awareness of the interconnected issues around how food reaches our plates. The Covid-19 crisis has brought this message home for everyone, highlighting the significant shortcomings of our current food system. “It is no coincidence that we see the highest death risk in people with poor health. This is very often due to poor diets,” explains Conde-Petit. “Obesity and diabetes are examples of how preconditions impact people’s prospects for battling the virus. We already knew that 11 million people die every year because of poor diets. High-energy food, too little fiber, too few micronutrients, too much fat, too much sugar, and too much salt have a very detrimental effect on health.”

These are major challenges for the food industry. The connection between health, the environment, and what we eat is unquestionable. Addressing these issues is a task that will require collaboration across many sectors, and Bühler is playing its part. Built on many decades of research and development in these fields, its Future of Food Program, led by Conde-Petit, provides food producers with some of the answers they need.

Understanding the needs of the market
One big part of the challenge is protein. The world’s population is increasing and there is a growing urban middle class with a large appetite for resource-intensive food such as meat and seafood. The average consumer needs around 50 grams of protein a day, but we are consuming 80 grams. This is not sustainable. In addition, we are using too many of the world’s resources to produce the foods we consume. One of the worst bottlenecks is our use of land – 62 percent of arable land is used to feed livestock, but we extract only 17 percent of the calories needed to nourish humans from it. On top of this, nature is being destroyed by our actions and biodiversity lost at alarming rates.

“Our current food system is inefficient. In wealthy countries, close to 80 percent of the proteins we consume are from animal sources and only 20 percent from plants. It should be the other way around. The challenge for the food industry is to produce more food using less agricultural land. That means we need to do more with the plants we grow,” Conde-Petit explains. “We understand the immensity of the challenge and recognize that we need to double the protein supply by 2050 and do it in a sustainable way. As such, we are focusing on plant-based resources. We are looking at pulses – beans, lentils, and chickpeas – and how to do more with them.” Today they are traditional staples but also increasingly interesting ingredients for new foods,
such as plant-based meat alternatives or plant-based beverages and dairy alternatives. Scouting and analyzing these kinds of trends is part of Bühler’s collaborative innovation approach.

“We are well connected to start-up accelerators. Through these we learn about the newest ideas, and through our wide academic network we can see the science and technology trends,” Conde-Petit explains. “We are also well connected to our customers. When they bring us their questions and problems to solve, we get an insight into what is driving the market. With these networks, we can leverage collaborative innovation from all angles.”

The raw materials of the future
By exploring possibilities within processing and value chains, and asking the right questions, Bühler is developing a range of possible solutions. Examples include the use of other protein-rich raw materials and harnessing the potential of upcycling protein-rich side streams to make new products. Rapeseed and sunflower press cakes – a co-product of extracting oil – are interesting side streams which are currently under-exploited and Bühler is already exploring processes for creating value as food ingredients, for instance for meat analogues.

The Future of Food team are also looking into ways of addressing the problem of limited land supply and how to make more protein-rich ingredients from single cell organisms such as microalgae, yeast, bacteria, and fungi grown by fermentation. With fermentation, cells become mini factories that efficiently produce valuable nutrients and functional ingredients, including proteins, omega 3-rich oils, and natural pigments, and such ingredients have already reached the stage of commercialization. It’s even possible to recreate animal products such as meat or fish by growing animal cells, and several start-ups are quite advanced in this field. Dr. Erika Georget, Project Leader for Biotechnology in the Bühler Future of Food Program, believes that fermentation technology will bring about a revolution in agriculture.

Why use the whole cow?
Conventional agriculture has outstretched its limits. We have to make it more efficient. “We don’t need the whole cow to get the tiny fraction of nutrients we take from it – we just need the relevant cells. And these nutrients don’t have to come only from animal cells – there are a number of other types of cells that are equally capable,” explains Georget.

This revolution in the way we think about nutrient production can also be seen in the example of omega 3-rich oil. Traditionally, it has been produced from fish or krill, but it can also be produced from

“We act as an accelerator, connecting our customers with the ingredients of tomorrow, helping them integrate novel ingredients into attractive formulations.”

Dr. Erika Georget
Project Leader for Biotechnology
Bühler Future of Food Program
Protein-rich ingredients from single-celled organisms such as microalgae, yeast, bacteria, and fungi are grown by fermentation. With Bühler extrusion technology, it is now also possible to use other ingredients derived from cellular agriculture – like microalgae or yeast – to produce attractive foods that go beyond the current results. “It is a very versatile tool,” explains Georget. “We can fine-tune it and get the best out of any of these ingredients.”

Expertise in processing also contributes to increased sustainability on the feed side. Bühler is at the forefront of solutions to leverage insects for upcycling organic waste and other biomass into feed ingredients for fish and poultry. However, it is not simply a matter of producing new ingredients, but also of looking at how these proteins are integrated to ensure optimum performance. For fish feed, for example, the density of the pellet determines whether it floats or sinks, which is critical in terms of fish feeding habits. “According to a recent study, by 2050 up to 19 percent of protein in animal nutrition could come from the tank. Our technologies can help to achieve successful recipes,” Georget explains.

Going upstream, another common challenge of cellular agriculture involves energy-efficient opening of the cells to release protein or other valuable ingredients. Microalgae, for example, have thick cell walls that take a lot of energy to open. Bühler is leveraging its bead milling technology to provide an energy-efficient, mechanical solution to this challenge.

**“WITH FERMENTATION, CELLS BECOME MINI FACTORIES THAT EFFICIENTLY PRODUCE VALUABLE NUTRIENTS AND FUNCTIONAL INGREDIENTS.”**

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**Dr. Erika Georget**

Project Leader for Biotechnology

Bühler Future of Food Program

Protein-rich ingredients from single-celled organisms such as microalgae, yeast, bacteria, and fungi are grown by fermentation.
As Bühler’s leading authority on food science, Dr. Béatrice Conde-Petit explores new sustainable food technologies that are key to the future food system. She is a food engineer, who spent 20 years as a researcher, lecturer, and industry consultant at ETH Zurich, Switzerland, before bringing her know-how to Bühler. She and her team explore the development of sustainable products, guiding Bühler’s customers – current and potential – towards new fields, such as alternative protein sources, pulse processing for plant-based meat analogues, and more.

Dr. Erika Georget is project leader for biotechnology within Bühler’s Future of Food Program. Her focus is on new ingredients and products that can be produced from the fermentation tank. She has a Ph.D. from Leibniz University Hannover in the field of food science and technology.

with a mix of customers, large and small, to find solutions. Some customers come with specific ideas that they want to make happen – the collaboration is all about finding the right processes. For smaller customers, the starting points for collaboration are different, and Bühler makes them aware of trends in the industry, shows them the processes involved, and highlights the opportunities. For example, it might be a miller who is currently not making the most of protein-rich side streams.

“There is space for everybody – for the big players, for the smaller companies, and for start-ups who have committed to what may be game-changing product ideas or technology,” says Conde-Petit. “They come with a completely new idea, but they might be very far from the reality of how to produce it, and we support them.”

Bühler is well aware that sustainability can be a business driver, with intriguing business potential. Of course, it is also about stepping up to global responsibilities. “We are in a central position to do this. We contribute to a significant percentage of global nutritional needs through our solutions, so we have a duty to support our customers on their journey towards the future of food, in particular when it comes to alternative protein sources,” Georget says.

While the challenges facing our food system are significant, with collaboration across the industry and countries, solutions can be found. “We are here to discuss very concrete challenges where a solution is needed today, but we are also here to discuss issues that are not yet fully solved,” says Conde-Petit. “Our customers look to our expertise to develop concepts which are more or less mature, to test them in our application centers, and to find solutions that meet the taste, convenience, nutrition, and affordability requirements of the relevant market, with sustainability designed in. Whatever the challenge, we are ready to help achieve these goals – because the future of the planet depends on it.”
In social media, the hashtags jump out at you: #meatfree, #vegetarian, and #govegan are some of the most popular searches on Instagram, Twitter and Co. If you are interested in healthy and sustainable food and are involved in the relevant interest groups, a brief look at online networks will show you that meat alternatives made from vegetables are on-trend.
PLANT-BASED ALTERNATIVES ARE BOOMING

Alternative proteins / #PLANTFORWARD

Picture: Hiltl Vegimetzg, Zürich
INFLUENCERS LIKE “plantbasedben” or Tabitha Brown “iamtabithabrown” have well over 100,000 followers on Instagram. Tabitha Brown’s video in which she eats the vegan version of a bacon, lettuce, tomato, and avocado sandwich with tempeh (a protein-rich soy food) went viral in 2018. It has been viewed 3.6 million times on Facebook. Tabitha’s response to her first vegan sandwich is illustrative of the change currently sweeping through the consumer landscape: “I take a look around and things look different. My life has changed right before my eyes.”

Start-ups offering alternatives to animal proteins are booming. Following the example of the American pioneers Beyond Meat and Impossible Foods, they are experimenting with the food of the future. The Chilean start-up, The Not Company, for example, is concentrating on vegan equivalents of egg and dairy products. Their most famous product, Not-Mayo, soon made it across the continent’s border. Oatly, the Swedish oat milk producer, has managed to more than quadruple net sales from 20 million in 2012 to 88.5 million in 2018 and is currently struggling with delivery problems due to the high demand.

Sales figures soar
It’s no good trying to play it down – vegetable protein substitutes have made it onto the shelves of the big retailers around the world. “A lot of people are trying to live more sustainably. They are rethinking their lifestyle,” explains Christoph Naef, Head of Human Nutrition at Bühler. And that includes lowering their meat consumption.

Innova Market Insights named “The Plant Kingdom” as the second biggest trend of the year in 2019. In the United States, the plant-based milk and meat substitute market increased by 20 percent to USD 3.3 billion in 2018, according to the Nielsen market research institute. However, this does not mean that the number of vegetarians and vegans has increased rapidly. According to a study by the NPD Group, 90 percent of people who eat plant-based protein substitutes eat meat as well. This new, growing consumer group calls themselves “flexitarians”. Flexitarians eat meat, but just occasionally, and they try to support more sustainable food production through their eating habits.

However, the sales figures should still be treated with caution, says Christoph Naef. “Data is often collected only on a regional basis and therefore relates only to this specific market. However, we assume that in the next 5 to 10 years, around 10 to 25 percent of the meat market will be replaced by alternative and sustainable products.”

The change in the consumer landscape is also being felt by Hiltl, a vegetarian restaurant chain and family business from Zurich, Switzerland, that has made a name for itself worldwide as the oldest vegetarian restaurant. “We are no longer just talking about a trend – it’s a movement,” explains Milo Stegmann, Hiltl’s Operational Marketing Manager. “For some years now, we have had the clear impression that people are becoming more conscious of their diet and are therefore giving up meat more often.”

And it is precisely because consumers do this for ethical and ecological reasons, not because they don’t like meat, that Hiltl’s vegetable meat substitutes are so popular. “Our customers don’t have to give up their tartar, cordon bleu, or meatloaf,” says Stegmann. “We offer a plant-based alternative that tastes great.” In response to growing demand, Hiltl opened the first vegetarian “butcher shop” in Zurich six years ago. “We always try to add new, innovative products to the Vegimetzg (veggie butcher) range.”
Hiltl’s bestsellers are tatar, cordon bleu, their vegan burger, and the shredded “plant-chicken” from the Swiss start-up, Planted. As a technology supplier, Bühler has a hand in most of these innovative products. For example, the vegetable chicken supplied by Planted is made with Bühler extruder technology (see pages 50-55).

At the forefront of development
The current consumer movement is the breakthrough that Bühler has long awaited. “Dry extrudates from plant proteins have been around for about 40 years. Originally, they were produced primarily for so-called meat extenders. Sausages or dumplings containing more soy than meat are now available in many countries,” says Naef. The turning point came with wet extrudates. Here again, Bühler is at the forefront of development. “We have been working intensively on the development of wet extrudates for about 10 years,” he says. “This has enabled us to position ourselves as a technology leader from the start when the market was ready for vegetable meat substitutes.”

Stegmann at Hiltl agrees that a decisive step has been made in terms of technology in recent years. “Vegetable alternatives to meat have improved considerably thanks to the refined technologies, and, above all, to the new and predominantly natural ingredients that are more readily available.”

Unbeatable expertise and efficiency
Customer inquiries have been arriving in quick succession for about two years at Bühler because it provides the benefit of differentiated process expertise and a high level of system efficiency. “We see ourselves as the clear market leader in wet extrudates. After all, we are the only ones who can provide the entire process chain in this field, from bean to burger. With our expertise when it comes to knowledge and handling of raw materials, raw material processing and protein texturing in the extruder, we can offer our customers unique added value for their businesses,” says Naef.

Bühler and its customers benefit from the fact that the range of source materials is more diverse today than they were 10 years ago. High-protein meat substitutes can be produced from peas, beans,
Plant-based meat substitutes are very popular. A chef from Hiltl prepares a curry made with planted chicken.

90 percent of consumers of plant-based meat substitutes eat meat from time to time. They are known as “flexitarians”.

“VEGETABLE ALTERNATIVES TO MEAT HAVE IMPROVED CONSIDERABLY THANKS TO THE REFINED TECHNOLOGIES, AND, ABOVE ALL, TO NEW AND NATURAL INGREDIENTS.”

MILO STEGMANN
Operational Marketing Manager at Hiltl, Zurich

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lentils, and even from press cakes the solids remaining from pressing oilseeds to make vegetable oil. Bühler has acquired decades of know-how in all these processing operations and has its finger on the pulse of innovative developments with newcomer ingredients, such as single-cell organisms including microalgae, yeasts, and fungal cells. “We are in the experimental phase here. Raw materials are not yet available in such large quantities and not yet at marketable prices. But we expect a breakthrough in three to five years at the latest,” explains Naef.

**Not just a local phenomenon**

According to Naef, the US is now far from being the only booming market when it comes to plant-based proteins. “We are seeing big momentum in Europe and Asia. Even in countries you might not think of at first, such as Italy, France, Malaysia, Indonesia, and China.” Growth is also expedited by economic and health factors spurred by the concerns around the spread of zoonotic disease, such as swine flu and coronavirus.

“You can see very clearly that the change makes a great deal of sense, not least from the ecological perspective. If you look at the CO₂ emissions required to produce the same amount of protein from meat or from plants, it is immediately clear which solution is more sustainable. Moreover, we will be dependent on plant proteins if we are to continue feeding humanity on a sustainable basis in the future.”

Intensive research and development efforts in recent years have paid off. Due to the increasing media presence of successful brands, continuing interest of customers, and rising sales figures, more and more food producers are taking an interest in the technology. In addition to the start-ups that have already made rapid headway with exciting products, many of which are working with Bühler, more and more traditional businesses are also becoming keen on these products. “We are seeing a large number of inquiries from long-standing Bühler customers who see an opportunity to differentiate themselves with such products – for example from the flour milling industry,” explains Naef.

A novelty in Bühler’s history with these types of products is the interest that is now being shown by meat processing companies, many of which are discovering the vegetarian and vegan markets. “This is a completely new customer group for us. But it is actually a logical step for these companies,” says Naef. “Although meat producers have so far had no raw material handling operations or extrusion solutions, most of them have the rest of the production chain. They have the further processing, the cold chain, and the packaging operations.”

Many meat producers regard products made of vegetable proteins as a supplement to their product range. The German company Rügenwalder, for example, known for its sausage products, has set itself the goal of offering 40 percent meat-free products in its range by the end of 2020. And more and more of these products are to be vegan.

**Driving product development forward**

In addition to its technological know-how, Bühler is globally connected in the food industry; it operates in over 140 countries and has application centers on several continents where customers can test new ideas and develop products within a short time. We are the only company in the industry that has an application center where we can map the entire processing chain. It is located in Minneapolis in the US. Customers can test processes from cleaning and sorting the bean to the finished extruded product. Bühler operates additional application centers in Switzerland and China; and in Singapore, the company will open a test center for plant proteins together with Givaudan, the global market leader in fragrances and flavors (see box).

For Christoph Naef, it is clear that the trend is not short-term hype, but an important step towards more sustainable food production: “We will need this capacity in the future to feed people with sustainable proteins. That is why I am convinced that this market will continue to grow steadily.”

**INFO**

**INNOVATION CENTER FOR PLANT-BASED FOOD IN SINGAPORE**

The leading supplier in the field of food technology and the global leader in fragrances and flavours are bringing their global partnership to South East Asia. Together, Bühler and Givaudan are building an innovation center for plant-based foods in Singapore. The new facility at the Givaudan Woodlands site will be operated jointly by both companies. It includes a Bühler pilot plant with extrusion and process technology as well as a Givaudan cuisine and flavor laboratory. The innovation center is available to food processing companies, start-ups, and university researchers who want to develop novel plant-based foods. The center is scheduled to open in Spring 2021. To learn more about this sustainable partnership, read the interview featuring Givaudan Head of Science and Technology, Fabio Campanile, and Bühler Chief Technology Officer, Ian Roberts on pages 56 to 61.
More and more people are eating less meat, whether it be for environmental, ethical, or health reasons. They want nutritious alternatives that taste great. Today’s plant-based meat substitutes offer both. When it comes to the technology and know-how behind this growing market, Bühler has the edge.

Raw materials

**Soybeans**
Some 6% of the world’s agricultural land is cultivated with soy. This legume is considered to be the most important oilseed and is widely used for the production of feed. Because of its high protein content, it has also been used in Asia for hundreds of years as a vegetable protein source, for example as tofu.

**Pulses**
Beans, peas, chickpeas, lentils, vetches, and lupins belong to the legume family and can be dried and used as healthy and nutritious foods. Hundreds of varieties are grown in 173 countries around the world. Pulses are a low-fat source of proteins that also contain fiber and important micronutrients.

**Oilseeds**
Oilseeds are energy-dense foods, due to their high oil content. They are rich in protein, fiber, vitamins, and minerals. They make a naturally significant contribution to human dietary protein intake. Sunflower seed and rapeseed expeller cakes are nutritious and healthy ingredients for meat substitutes.

**Tomorrow’s protein sources**
The cultivation of single-cell organisms with a high protein content is a field widely researched at the moment. Many universities and research institutes have developed initial projects for growing microalgae, yeast, fungi, or bacteria in tanks. When extracted as powder, they can be a valuable resource of protein for meat substitutes.

Process

The raw materials are processed into protein isolates (wet process) or protein concentrates (dry process). Both can then be used as the main protein source for the production of meat alternatives.

**Protein concentrate or isolate and oilseeds**
Protein concentrates are derived from the mechanical separation of flour, using the density difference from the starch and protein fraction. Protein isolates are further separated with a wet process, where the proteins are dissolved. These products are typically higher in protein content, with less taste from the origin raw material. Oilseeds expeller cake can be upcycled after the oil pressing and used as a high-protein ingredient.

**Fiber-rich fraction and flours**
Fibers are a healthy ingredient that is naturally available in the raw material. With added fiber, the product texture becomes stronger, and the protein network is more stably interlinked. There is a multitude of fibers available, like pea, citrus, or apple fibers. Flours can also be used as a minor or major ingredient to adjust the product behavior.

**Starch-rich fraction**
The side streams of the protein extraction process contain a high amount of starch which can still be used as a healthy ingredient for other food and feed applications. In particular, they are ideally suited to the production of noodles, snacks, or chicken feed.

**Preconditioner**
Water, oil, and steam

Water
Global meat market forecast
A number of meat alternatives are evolving, among them extrusion, cultured meat, and fermentation-based technologies, each with the potential to disrupt the global meat industry. Source: ATKearney

Extruder
The versatile twin-screw extrusion technology transfers the plant protein mixture into a fibrous, meat-like textured product. A dough is created with the mixture of water and proteins. With the application of mechanical shear force and temperature, proteins are denatured and fibrous structures are generated.

Fortification and flavoring
Ideally, meat substitutes contain all of the positive ingredients of meat, without too much fat and cholesterol. Important vitamins, such as B12, and minerals, such as iron, fortify the textured product. In some cases, natural flavors are added as well to imitate the taste of real meat in the product.

Total consumption of meat substitutes 2019
Western Europe, North America, Australasia
Source: Euromonitor International

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The versatile twin-screw extrusion technology transfers the plant protein mixture into a fibrous, meat-like textured product. A dough is created with the mixture of water and proteins. With the application of mechanical shear force and temperature, proteins are denatured and fibrous structures are generated.
Four university graduates from Zurich have quickly conquered the Swiss plant-based food market with their start-up, Planted Foods AG. Their flagship product, planted.chicken, convinces due to its amazingly genuine texture and because it contains absolutely no artificial additives. With Bühler as their technology partner, the four founders have ventured into industrial production.
THERE IS A MONUMENT to the birth of industrial food production standing in Kemptthal, Switzerland. Here, almost a century ago, Maggi, the company known today by homemakers and cooks around the world for its bouillon cubes, liquid seasoning, and ready-made soups, started production. Maggi was ultimately acquired by Nestlé in the 1950s, and in 2002, soup production was moved to Germany, leaving the factory still.

The area where Maggi once produced soups has come back to life as “The Valley” – an industrial zone of 100,000 square meters with historical buildings that are now being used by research groups, start-ups, stores, and restaurants. Just 20 minutes by car from Zurich, the area is fertile ground for pioneering work and innovation.

Planted Foods is one of the new residents. In June 2020, the start-up began production in one of the former Maggi production halls with a product that is just as innovative as the bouillon cubes were 100 years ago. Planted Foods produces its “planted chicken” – strips of chicken made from pea protein.

“We researched all possible proteins available, from algae to sunflower seeds to yellow peas,” explains Christoph Jenny, co-founder of Planted Foods. “Yellow peas suited our first product, planted chicken, perfectly because the nutritional value and the fibrousness of it are surprisingly similar.”

Jenny is one of four co-founders of the ETH Zurich spin-off that came out of the Laboratory of Food Process Engineering at the Institute of Food Nutrition and Health, headed by Professor Dr. Erich Windhab. The four young men met in the research facilities of the university. There Eric Stirnemann is completing his doctorate in the field of Food Process Engineering. Lukas Böni also completed his doctorate there.

Using an extruder from Bühler, Stirnemann experimented with the perfect formula for plant-based meat substitute products. Böni did his doctoral research on hagfish and had the expertise in handling soft textures. The business expertise came from Pascal Bieri, who studied Business, and Christoph Jenny, who received a degree in Finance from the University of Zurich. It was the perfect starting point for an exemplary success story.

Only natural ingredients
Inspired by American pioneers such as Impossible Foods, the founders wanted to develop their own meat substitute products completely without added artificial ingredients: “Our products should have no added artificial ingredients and be 100 percent vegan. No animal products, no antibiotics, no GM (gene modified) ingredients, no gluten, and no preservatives,” says Jenny. The ETH was won over by this idea, and the Planted Foods project received
CHF 150,000 start-up capital from the university’s Pioneer Fellowship Program. Now the adventure could really begin. Eric Stirnemann’s doctoral research had laid the foundation for the project so that by 2018, the group had already developed their promising product prototype. Then things began to speed up rapidly.

In March and April 2019, the first samples were ready for visitors at various trade fairs. By May, Planted Foods received its first restaurant order. “The innovative restaurateurs were enormously important to us in bringing our product into the market,” says Bieri. “They tested our product and gave us valuable feedback that we could use for our continued development.”

Full steam ahead
With their planted.chicken, the four young men conquered the market in no time. About a year after receiving the first order, Planted Foods was already supplying more than 100 restaurants, a few grocery wholesalers, and the SV Group, a gastronomy and hotel management group operating many employee restaurants in Switzerland.

At the beginning of 2020, Coop, a supermarket chain in Switzerland, became Planted Foods’ first large-scale retail customer. “Our customers should always be able to find a current, modern, and innovative product range. That’s why we watch the market and follow new trends and product developments worldwide. This is what led us to Planted Foods,” says Stephanie Sonderegger, Coop Purchasing Manager. “We immediately liked the product for its taste and consistency. It is the best chicken substitute currently on the market.”

The chicken substitute has quickly become popular among Coop customers,” Sonderegger says. “What we really like is that the start-up, Planted Foods, values sustainability. That aligns perfectly with Coop’s philosophy.”

Sustainability is one of the most important pillars of Planted Foods’ philosophy, Jenny explains. “Our products help make an active contribution to the climate and environmental protection. Compared to conventional animal production, the production of the Planted Foods products uses 90 percent less land, 66 percent less water, and generates 66 percent less greenhouse gases.”

And the start-up’s original goal was also met. Its sale product is made of yellow pea protein, pea fiber, rape seed oil, and water, all-natural ingredients. In order to increase the nutritional value of it as a vegan meat substitute, vitamin B12 is added. This is usually found only in animal products.

Already at Version 2.3
The successful market launch of planted.chicken, however, is just the beginning of this start-up’s story. According to Böni, Planted Foods operates like a software company. “We started with Version 1.0 and are now at Version 2.3.” For this stage, Planted Foods has launched its own online shop where customers can take part in surveys about the various versions. “That means that our product is basically never finished with development. We are perfectionists and try to advance with each release.”

It is quickly evident that a lot has happened in a very short time at Planted Foods’ production premises. The offices at the Institute of Food, Nutrition and Health laboratory at the ETH in Zurich were bursting at the seams. There was barely enough workspace for the growing team, and sometimes people even worked with their laptops on their knees sitting on the stairs outside.

Even back then, the technological heart of the actual production process – an extruder from Bühler – was already working at full speed. It kneads and heats the ingredients for the plant-based chicken and arranges them in its interior to form a new microfiber structure. “The extruder enabled us to perform the first production scaling,” explains Stirnemann. The topic of scaling occupied the four founders again with their next big step: Planted Foods moved into its own factory in Kemptthal in June. “We purchased our own production line from Bühler, which made it possible for us to scale up to an industrial level,” says Stirnemann.

This move equals an increase in production capacity from about 500 kilos per day to 500 kilos per hour. “It is great for us to have a technology partner like Bühler at our side, one that has constructively supported us,” Stirnemann explains.
The Bühler project team received the order to set up the new production facility and started work in November 2019. Installation started in April 2020. This was a challenge in terms of time. “We wanted to be able to put the plant into production within one month,” says Randolph Geitel, Project Manager at Bühler. “Traditional delivery times have become obsolete in this market. We have to be extremely fast and flexible if we want to be part of such innovative projects. We rose to the challenge and production started in June.”

Factory and showroom in one
Another tricky condition for the new production facility was that the factory had to be publicly accessible for visitors and visible from top to bottom along the entire value chain. This is a novelty for industrial food production. “We want to be open and transparent to consumers about what we make, which is 100 percent natural,” says Jenny. “Our concept has already received a lot of interest, and we receive a huge number of requests for tours.”

The production facility in Kemptthal is both an industrial food production plant and a showroom. As Geitel explains, this posed completely new challenges for project management. “The design had to be functional and at the same time totally clean and attractive. In addition, there were special requirements regarding noise emissions. The facility had to be publicly accessible without visitors needing to wear ear protection. Special measures were also needed in terms of food safety,” he says.

But for Geitel, this was no obstacle. “Basically, no project is the same. We don’t sell rack plants. Our solutions are always engineered specifically for the customer.” Geitel also sees a large added value for Bühler with such projects. “Most people have no idea what an extruder is. In Kemptthal, we now have a platform where we can present this,” he explains.

Research remains the focus
Planted Foods has succeeded in getting out of the research lab and into the commercial market, but it wants to stay relatively lean in the beginning. “We do need to bring a new product to market every few months. We want to attract people with simplicity more than anything.”

Nevertheless, according to Jenny, the team already has a new creation in the pipeline: “We launched the planted.pulled this summer. It’s a pulled pork product made from plant proteins, which we are selling primarily to catering establishments for the time being.”

And the tasty revolution will continue, thanks to a strong focus on research. “Of the 55 employees at Planted Foods currently, 20 are working in research. We want to keep this focus and continue making our contribution to better substitute meat products.”
Hardly distinguishable from real meat: The planted.chicken made from yellow pea protein.

After years of research, Planted Foods has begun industrial production in Kemptthal.

“IT IS GREAT FOR US TO HAVE A TECHNOLOGY PARTNER LIKE BÜHLER AT OUR SIDE, ONE THAT HAS CONSTRUCTIVELY SUPPORTED US.”

ERIC STIRNEMANN
Co-founder of Planted Foods AG, Zurich

Hardly distinguishable from real meat: The planted.chicken made from yellow pea protein.
What does it take to drive food innovation while making an impact on the climate and nutrition challenge? A shared vision. That’s exactly what has led to a growing partnership between Bühler and Givaudan. In this interview, Givaudan Head of Science and Technology, Fabio Campanile, and Bühler Chief Technology Officer, Ian Roberts, reveal the deep roots that run between the two companies and explain their ambitions to accelerate change in the food industry.
Givaudan and Bühler / #JOINTEFFORT
Fabio, before we dive in, could you explain what Givaudan does and about your role in the company?

Fabio Campanile: I am responsible for innovation around new products and new technologies. The area we mainly focus on is foods. Our traditional legacy business has been in flavors, but over the last two years, we have been moving into new areas around natural ingredients, colors, preservatives, and also functional ingredients, such as health functionality. Some of these ingredients come with authorized health claims, while others are intuitively associated with positive health benefits.

So, is wellbeing a key market for you?

Campanile: Yes, it is about improving the consumer experience, which could be about pleasing the palate, adding visual appeal – the qualities that allow food to make people happy. It's also about the positive health benefits, because we believe that through food, we can help people live longer, better, and healthier lives.
Can you expand on this idea of developing new flavors?

**CAMPANILE:** It’s not just about flavors, it’s about developing a much more complex range of food ingredients. Beyond producing a flavor for a product, it’s also about shaping or formulating a food to resolve a particular challenge. One example is the challenge of formulating foods with a clean label. There are many new food categories in the market. For example, there has been a huge surge in meat alternatives over the past three or four years that did not exist before. From taste to texture and nutrition, these products also present specific formulation challenges.

Ian, how did the partnership with Givaudan come about?

**IAN ROBERTS:** We have been physical neighbors for years. We are in Uzwil and Givaudan is in Diibendorf, which is less than an hour away. Proximity has always helped us in our partnership. We have been working together on and off for decades, which means we have a history based on trust. Secondly, we have many of the same customers. They come to us looking for technology and to Givaudan for flavors and ingredients. It makes perfect sense to harness these synergies and work together to provide better solutions for our customers. On top of that, we’ve both been playing a very strong role in building a Swiss collaboration ecosystem and establishing Switzerland as a hotbed for food innovation and sustainable food systems in the future.

You are both on the board of the start-up accelerator MassChallenge Switzerland. What impact has that had on the partnership?

**ROBERTS:** The work we’ve done with start-up ecosystems has really brought us together as companies. By bringing MassChallenge to Switzerland and by developing that ecosystem, we’ve built a relationship where we jointly support young entrepreneurs in building their businesses more successfully.

Both companies benefit from having the opportunity to change our internal cultures as we learn from the start-ups and exchange ideas on how to best support them. We openly support start-ups that might be looking at a type of technology from Bühler and also getting help with formulations from Givaudan. This way we build trust and partnership, which is a good foundation for future projects. For example, we have complimentary capabilities around alternative proteins, where we not only offer support to start-ups, but also to major corporations globally.

What do big companies like Givaudan and Bühler expect to learn from start-ups in return?

**CAMPANILE:** Start-ups allow us to expand our ideas around innovation because they offer the sort of solutions that we are looking for. They also challenge our ideas about what we should be offering in the future. We should not forget that many of these start-ups are also potential new customers. In many cases, the journey that they embark on may lead them to become the big customers of tomorrow. They also have the ability to challenge organizations and get inspired in a much more agile way. Many of these start-ups can teach us how to innovate faster.

What can you achieve together in addressing the climate and nutrition challenge?

**ROBERTS:** Bühler and Givaudan have an enormous commitment to sustainability – it is embedded in the core of what we do. We must unite behind the common goal of creating sustainable food systems that can feed 10 billion people in 2050. We must also be able to deliver accessible and affordable food that tastes great and is highly nutritious without causing a massive drain on the planet's resources.

To solve problems of this magnitude, it is vital to work with partners, as there is no way that one company has the capability to address all of these challenges alone. This is why partnerships are so attractive, whether the partnerships are with a great company like Givaudan, with customers, with universities, or with start-ups with key technologies capable of cutting our CO2 footprint. We need partners to scale up ideas and support customers. This is a common mission for both companies.

**CAMPANILE:** I would like to add that we obviously also need to do our part as companies to cut CO2 emissions. But the biggest impact we can have is by changing the way we produce, process, and distribute food to customers.

"OUR COMBINED EXPERTISE WILL ALLOW FOR NEW RANGES THAT CATER TO THE TASTE, TEXTURE EXPECTATIONS, AND COOKING TECHNIQUES OF ASIA."

**FABIO CAMPANILE**
Head of Science and Technology at Givaudan
You will soon open an Innovation Center dedicated to plant-based food in Singapore. How did that decision come about?

CAMPANILE: I think it’s just the way the industry is evolving due to the need to address big challenges around food supply. Things are moving so fast that we need multiple partnerships to meet these challenges, whether around alternative proteins, sustainability, or health. There is also the issue of the speed with which innovations come to market. How can we make them scalable faster? Scalability is a particular challenge for start-ups.

Even our well-established customers, who have been making a certain type of product for the last 20 or even 100 years, are very interested in developing new products. The hub in Singapore will help build the sort of ecosystem we have been dreaming of, facilitating the creation of new products.

ROBERTS: What Singapore is doing to build this ecosystem is extraordinary. There is financing, venture capital, and accelerators, and many regional headquarters of major companies. It’s a very attractive market. We always found customers would come to Givaudan and then they would come to us. The logical step was to join forces to provide customers with a one-stop shop for technology capability, product development, ingredient development, and flavor. It’s a fantastic experiment. You can count on one hand the number of joint facilities run by multiple companies around the world. If we get this to work, this is a lesson in how we can partner in the future.

Why Singapore, and what can customers expect from the Innovation Center?

CAMPANILE: Singapore is a diverse country at the heart of Southeast Asia with strong ambitions for the future of food. We see a lot of market potential for plant-based products in the coming years in Asia and in the alternative meat sector in particular.

Our combined expertise in the development and manufacturing of plant-based foods will allow for new ranges that cater to the taste, texture expectations, and cooking techniques found in Asia. The initial focus on extruded products is important, as this is a key technology for developing authentic meat alternatives.

ROBERTS: We will not only welcome food processing companies, but also start-ups and university researchers looking to develop novel, plant-based food products. They will benefit from our extrusion and processing know-how and Givaudan’s flavor, taste, ingredient, and product development expertise.
Do you plan on opening your collaboration model to more players from the food industry?

CAMPANILE: It’s already happening. People want to join us and we’re delighted to welcome them to this constantly-evolving ecosystem. We need the complementary skills of various partners to resolve the existing challenges. It’s not something we can do on our own.

ROBERTS: Absolutely. Even when you combine knowledge to build something jointly, you still realize there are gaps. There are entire areas where other companies have a great deal more expertise than either of us. Inviting them in to strengthen our ecosystem would be a logical step.

You had planned to open the Innovation Center in summer 2020, but were delayed by the pandemic. Do you have new date in mind?

ROBERTS: We anticipate that it will be fully operational in March 2021. Of course, a few things are beyond our control due to the coronavirus. Depending on how things develop, the planned opening in March will either be physical or virtual.

What do you plan to do next in this partnership?

CAMPANILE: I am sure there will be many more opportunities. I would love to replicate this project elsewhere. It would be a natural progression. There is more that we could do in North America or even here in Switzerland.

ROBERTS: I believe there are multiple opportunities. There are food innovation hotspots around the world where it would make sense to join forces. We will continue driving MassChallenge and the startup accelerators. We will keep driving the Future Food Initiative by pooling the academic prowess of Switzerland and continue to attract talent capable of tackling new challenges.

We want to create a critical mass of know-how in Switzerland by creating a Swiss Food and Nutrition valley. As for the global market, the plan is to replicate collaborative partnerships around the world.

“IT MAKES PERFECT SENSE TO HARNESS SYNERGIES AND WORK TOGETHER TO PROVIDE BETTER SOLUTIONS TO OUR CUSTOMERS.”

IAN ROBERTS
Chief Technology Officer at Bühler

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Future Food Initiative was launched by ETH Zurich and EPFL (École Polytechnique Fédérale de Lausanne) together with Bühler, Givaudan, and Nestlé as the first partners on board. Its goal is to expand research and education in the area of food and nutrition sciences by bringing competences from academic and industrial research together.
OATMEAL:
HOW THE ANCIENT WHOLE GRAIN BECAME A TRENDSETTER

TEXT: MARKUS REBER, PHOTOS: DAVID CLYNCH, ANJA METZGER
Easy to cultivate. Nutritious. Healthy, and even healing. Oats have been served at tables around the world for centuries. This super grain has a long tradition as a staple food. Producers are rediscovering it, for example as a milk substitute or gluten-free food. Oats now represent tradition and modernity, and for the past six years Glanbia Ireland has been serving both worlds.
IT’S AS THOUGH THEIR HARD LIFE has given them extra strength. When oats are golden yellow and ready for harvest at the end of summer, they have lived a life of deprivation, of barren soil, and the cold and wetness of the northern latitudes. What it then produces as a processed grain is astonishing.

It is rich in vitamins, unsaturated fatty acids, proteins, vitamins, and fiber. Porridge is a traditional staple food, primarily of the English-speaking world and Northern Europe. “A diet containing oats or other whole grains has been shown to lower cholesterol and blood sugar levels,” explains Professor George Grimble of University College London. “It has been found that people who habitually consume diets with high whole grain content, including oats and rye, have reduced the risk of life-threatening heart disease by about 25 percent. In terms of clinical benefit, this is huge.”

A research group led by Professor Shengmin Sang and Dr. Changling Hu at the North Carolina Agricultural and Technical State University is currently investigating the potentially healing effects of oats.

INFO

Glanbia in a nutshell

Glanbia is an Irish food company operating in 34 countries worldwide. The company produces foodstuffs such as snacks, and sports nutrition and dairy products. Glanbia is the largest milk processor in Ireland. It employs around 7,400 people. In 2019, it achieved a turnover of EUR 3.9 billion and a profit of EUR 180 million.

“AS FAR AS CLEANLINESS AND FOOD SAFETY ARE CONCERNED, HARDLY ANYONE CAN HOLD A CANDLE TO GLANBIA.”

MATHIAS HANNSBAUER
Head of Business Segment Oat at Bühler
“Increasing evidence supports that whole grain oat is more than just a fiber, but has unique compounds called avenanthramides that are structurally similar to an anti-allergic drug,” explains Prof. Sang. “The study of the health benefits of oats is still in its infancy, but it is clear that daily oat consumption is very good for your health – as long as you refrain from adding sugar to your oat meal.”

The health benefits of oats, along with increasing market penetration of breakfast cereal products and oat-based snacks, and the trend toward milk-substitutes, has led to the food industry – and consumers – rediscovering the potential of this ancient whole grain.

Glanbia Ireland combines tradition and foresight in its oat production. The company supplies customers in the United States who expect particularly high quality and who process Irish oats into premium porridge. The cultivation of oats has a centuries old tradition in Ireland, the United Kingdom and Northern Europe. Glanbia exports about 50 percent of its production to the US. “What our customers appreciate about us is that we have been able to supply them with our best oats virtually from a standing start six years ago,” says Glanbia Plant Manager, Diarmuid Doran.

He slips on a protective gown and cap in front of the mill entrance and picks up a measuring cup. As Plant Manager, he runs the oat mill. “The origin of the product plays an important role here at Glanbia. These oats come from Irish fields and are processed here. For many consumers this has a touch of nostalgia, grain from ‘old Europe’ so to speak,” says Doran. He walks past an observation window. Behind it, hulled oat grains are being processed.

Glanbia has already won over the US market with its flawless quality, and other markets have taken notice. For many, the argument par excellence is that the entire mill can switch to gluten-free production. “We’ll get to the subject of gluten-free oats later,” says Doran. “First we’ll take a sample.” He walks up to the next floor.

**From seed to flake**

Doran and his 12 employees operate the oat mill in 24-hour shifts with a capacity of up to 2.25 tons of finished product per hour. Within the Glanbia food company, oat production is just a small segment of what it does.

Why does Glanbia’s oat division exist at all? An American customer was interested in top quality Irish oats a few years ago. “The fact that we have now been successfully exporting to the US for six years is also thanks to our partners,” says Doran. “We can tailor production from sowing to export to suit the customer’s needs.”

Over 5,000 farmers supply their products to Glanbia as a cooperative. They also include 150 hand-picked family farms that deliver oats to the mill in Portlaoise in the Irish Midlands. Experts from Glanbia advise the farmers on field and seed selection, cultivation, and harvest. Most of the fields are within a radius of 30 kilometers from the mill. This ensures low transport costs and lower CO₂ emissions compared to the competition. At the same time, there is also less food waste, because Glanbia processes the oat hulls in a feed mill just a few meters away from the oat mill.

Not only dust is unwanted

As Doran walks through the oat mill, it seems clinically clean. Mathias Hannsbauer, Head of Business Segment Oat at Bühler, is impressed. “We like to come to Glanbia with other customers or interested parties to show them how a benchmark oat mill works. As far as cleanliness and food safety are concerned, hardly anyone can hold a candle to Glanbia.” Bühler technologies are designed to minimize the buildup of deposits and to be easy to clean. “But food
safety starts with the millers,” says Hannsbauer. “And here at Glanbia, we see that the employees know their craft.” Hardly any signs of wear, and meticulous cleanliness. The first impression does not deceive. In fact, the British Retail Consortium (BRC) has given the oat mill its highest rating of AA for food safety and quality. When asked about this, Doran smiles and says modestly: “We only apply what Bühler has shown us in their milling courses and work diligently to ensure that no dust is deposited anywhere.” He uses a measuring cup to remove a handful of oats, places them in beaker, and then gently shakes the grains for inspection. “If there is one thing we want even less than dust,” – he points to the beaker – “it is gluten. But let’s test it first.” He takes it to the lab for analysis.

Gluten-free oats for the European market

The world’s strictest food regulations on gluten-free foods stipulate that one million grain pieces may only contain 20 particles of gluten. “We guarantee that our product contains less than 10 particles per million. And our analyses show that we are well below that,” says Doran. Bühler worked with Glanbia to ensure that by the time the plant was up and running, gluten-free production would be assured, but it only started gluten-free production a year later to ensure readiness. Glanbia's employees were trained in Bühler milling courses, where they learned how to adjust their technologies to achieve optimum yields at all times while ensuring maximum food safety. “We always know Bühler is behind us,” explains Doran.

Glanbia starts with food safety before any sowing takes place. Here too, the company benefits from its farmers' cooperatives. “Our quality experts recommend that farmers follow a cultivation sequence that excludes gluten in the field as much as possible,”

“WITH OUR CLOSED PRODUCTION CHAIN, WE CAN TRACE EVERY LOAD OF OATS COMPLETELY AND WITHOUT INTERRUPTION.”

DIARMUID DORAN
Plant Manager at Glanbia

Stringent food safety and the highest quality makes Glanbia a popular showcase for other oat milling customers and prospects.
says Doran. This also applies to the choice of seeds and crop protection products. Glanbia provides farmers with combine harvesters that have never harvested anything other than gluten-free grain. The grain silos have also never stored anything else. “With our closed production chain, we can trace every load of oats completely and without interruption,” says Doran. “If the quality is right, the yield is right in the end.” That benefit also applies to the farmers: They can sell the high-quality, gluten-free grain for a higher price.

Glanbia introduced gluten-free oat production in its first year of operation. Since then, it has grown every year. Today, gluten-free accounts for 50 percent of the company’s production that does not cross the Atlantic. Glanbia sells mainly in the form of oat flakes to customers throughout Europe – from the far north to Spain. The largest single market is the United Kingdom. “The oats we produce for the European market are almost exclusively gluten-free. We want to continue to grow in Europe,” says Doran.

Another step in this direction is Glanbia’s first porridge pot for the retail trade. They have been available in all supermarkets in Ireland since October 2019. The company is also looking into producing specialized oatmeal, for example for vegan drinks or sports nutrition. “Producers in Europe are currently focusing very strongly on innovation,” says Hannsbauer. Oats will probably gain in importance as a foodstuff as producers start innovating. “Meanwhile, consumers are returning to old grain varieties that are wonderfully suited to expand the range of vegan and gluten-free foods on offer.” Many companies are also working to develop sugar substitutes from oats, oatmeal in yoghurt, oat oil, bread supplements, oat pasta, meat substitutes and new gluten-free oat products. Glanbia is also active in this field. In September 2019, it announced that it would double the area under cultivation for gluten-free oats.

Glanbia is in discussion with Bühler about other ancient grains – such as quinoa – and an expansion of the capacity of its oat mill. Space for this was planned in from the start. Incorporating a new grain would mean new processing methods and even more complexity in the Glanbia oat mill.

How does Doran feel about the new challenge? He looks out the laboratory window. Behind it, Bühler technologies are operating at full capacity, removing foreign materials, cleaning the oats, separating them from their hulls, sorting out grains that are too dark – the grains are moving up and down in dozens of tubes to the next processing step. “A new grain presents new challenges. But if we were to decide on a new product, we know that we can count on all our partners – from the field to this facility.” He heads for the next floor of the mill. And as he walks by, he wipes a residue of dust off a flat surface.

When constructing its mill, Glanbia planned in extra space to increase capacity when the time is right.
PICTURESQUE sandy beaches, pulsating samba rhythms dictating the pace of life, and a favorably mild climate all year round. The attributes that come to mind when thinking about Brazil certainly must have encouraged Renzo Giovanni Martini when he set up his production site near São Paulo in 1953. “My grandfather was a very determined man with a clear vision. At first, he produced and delivered the cones all by himself,” says Daniel Martini, co-owner and Industrial Director at Marvi. Over the course of seven decades, Renzo Giovanni Martini’s children and grandchildren have continuously developed the family-owned company into one of the biggest players in the Latin American food market.

70 cones per second
Fast-forward to 2020 and production is running like clockwork: Marvi’s almost 500 employees operate nine dough mixers, eight ovens for wafer stick production, and eight ovens for molded cones and cups as well as three ovens for cone production. In their 30,000 m² facility, Marvi produces over 6 million cones each day, offering more than 700 different products to over 10,000 customers in Brazil. “In a 24/7 production environment, this results in almost 70 cones produced every second. One can imagine that such volumes require an incredibly high level of automatization and harnessing the power of digitalization,” Martini explains.

The rapid growth of the company from a one-man-enterprise to a perfectly tuned, high-tech giant in food production is closely aligned with the technical progress in the consumer foods industry. “On the one hand, we’ve grown a little more as a company with every innovation that came to the market. On the other hand, we’re constantly asking ourselves how we can produce more safely, efficiently and sustainably. In the end, it comes down
“WE PRODUCE EDIBLE WAFER CUPS FOR STARBUCKS, MCDONALD’S, AND LOCAL COFFEE SHOP CHAINS. TOGETHER WITH BÜHLER, WE HAVE CONTINUED TO IMPROVE THE PROCESS AND INGREDIENTS.”

DANIEL MARTINI
Co-owner and Industrial Director at Marvi

to the willingness to be open-minded for new technologies, implement them and continue to improve them,” says Martini.

Revenue stream for rainy days
It’s hard to believe, yet even in Brazil it’s not always summer. When temperatures drop, so does the appetite for ice cream, which is why Marvi was looking for an additional revenue stream in autumn, winter and spring. Around six years ago, the idea to produce goods for coffee shops to promote the Marvi brand came to life and discussions started.

“Initially, Marvi planned to develop branded edible cups, so we were engaged in an almost two-year research and development phase. We had to adapt the ovens to the new product, develop a dough that would hold liquid long enough for consumers to enjoy their coffee, and find a way to engrave the company logo,” recalls Marco Piva, Sales Manager at Bühler Brazil. “We first started with a small oven, but after one year of continuous growth, Marvi bought a bigger oven just for producing edible wafer cups.” The big players in the Brazilian consumer foods market soon wanted a bite of these sustainable and tasty cups.

“Today we produce edible wafer cups for Starbucks, McDonald’s and local coffee shop chains like Kopenhagen,” Daniel Martini explains. “Together with Bühler, we continued to improve the process and ingredients, and we now produce using our own signature dough recipe. After the baking process, we add a special chocolate layer to contain the liquid – double pleasure with zero waste, if you will.”

The sustainable and tasty cups have proven a hit in Latin America. Since production started, Marvi has sold more than 120,000 edible wafer cups, and the business forecast shows an upward trajectory.

A shared passion
Over 10,000 kilometers from São Paulo, Andreas Clemenz focuses on a new dough recipe in Bühler’s Wafer Application Lab in Leobendorf, Austria, where the scent of freshly baked wafer cups lingers. The food technologist and Department Head Application Technology, wearing a white lab coat and protective glasses, loves the science behind food processing. Together with his team of eight food technologists and three technicians, Clemenz focuses on creating the latest food sensations. His eyes fill with excitement when he talks about
Sustainable consumption is more than just a trend. It’s a common mindset shared across continents and cultures, and now that we’ve added indulgence into the mix, we’re convinced that edible food and beverage containers will soon be the rule rather than the exception,” Sauerschnig explains.

Seemingly endless potential
It seems that not even the sky is the limit for edible food and beverage containers. Among many other big companies, Air New Zealand is currently trialing vanilla-flavored edible coffee cups to minimize the environmental impact of its 8 million coffees served each year. “The cups have been a big hit with the customers who have used these, and we’ve also been using the cups as dessert bowls,” says a spokesperson for the airline.

Sauerschnig sees even bigger potential for edible containers for food and beverages. “What’s even more exciting is the many segments where the product can replace single-use plastics such as plates, cutlery, straws, packaging and so on,” he says. With companies like Marvi always on the lookout for new markets and taking the big players along the journey, one thing is certain: guilt-free, eco-friendly, and sustainable indulgence has all the ingredients to be a major force in the fight against single-use plastic.

Adding indulgence into the mix
So what’s next for this tasty and sustainable revolution? Günther Sauerschnig, Head of Global Sales at Bühler’s Consumer Foods Business, is optimistic.

“We offer process solutions that enable customers to produce cups that hold hot beverages for up to 45 minutes.”

Andreas Clemenz and his team of food technologists in Leobendorf, Austria, is testing dough for wafer cups.

Andreas Clemenz
Department Head Application Technology at Bühler

“We OFFER PROCESS SOLUTIONS THAT ENABLE CUSTOMERS TO PRODUCE CUPS THAT HOLD HOT BEVERAGES FOR UP TO 45 MINUTES.”
A COLORFUL, VIRTUOUS CIRCLE

TEXT: LUKAS HOFSTETTER
PHOTOS: JUDITH AFFOLTER, JEKATERINA GLUZMAN
In the country of birth of Johannes Gutenberg, the inventor of the printing press, Epple Druckfarben AG has perfected the production of high-quality printing inks. For 150 years, the family business from Bavaria has been supplying customers with printing inks that breathe life into books, magazines, packaging, and posters. Among them is this magazine from Bühler, the result of a unique relationship between suppliers, producers, and customers.
THE BÜHLER THREE-ROLL MILLS, at the headquarters of Epple Druckfarben AG in Neusäss near Augsburg, Bavaria, efficiently and evenly disperse pigments into endless, almost hypnotic streams of color. The fascinating thing here is that only four basic colors are produced: cyan, magenta, yellow, and black (CMYK for short). The “K” actually stands for the term “key plate”, which is used to align the cyan, magenta, and yellow color-printing plates.

It is these four basic colors which theoretically enable the creation of around four billion color tones that form the foundation of what Epple calls, the “essence of passion” – its company motto. These colors bring beauty to art, books, calendars, magazines, and even the eye-catching packaging of goods and foodstuffs. “We produce around 10,000 tons of printing ink a year and deliver to all continents,” explains Dr. Carl Epple, member of the Executive Board who is responsible for development and innovation at the company. Some of this ink goes to Switzerland, or more precisely to the galledia group ag publishing house in Flawil, just minutes from the Bühler headquarters.

This in itself would be rather unspectacular if it weren’t for the fact that galledia group prints this magazine for Bühler, which in turn supplies Epple with process solutions for the production of the printing inks. But more about that later.

Commercial printing houses across the world must be able to rely on the highest, flawless quality of inks at all times. Thanks to its investment in automation and equipment, Epple fulfills this quality commitment across the board. Emil Schrötter, Process Engineer at Epple, explains what’s needed to achieve success. “We have four fully automated, fully integrated production lines, consisting of component pre-weighing and pre-dispersion, a Bühler K240 bead mill and Bühler SDVE-1300 three-roll mill. This enables us to achieve optimum pigment fineness right from the start,” says Schrötter.

For comparison, in other competing companies that do not have this type of production line, the product passes through the mills up to four times to achieve such fineness, and this entails a massive expenditure of time and money. “Thanks to our ultra modern industrial production process, we have automatic production on four lines managed by one person only,” Schrötter explains. This is a level of efficiency and reliability that Epple also owes to its constant drive for improvement.

“We appreciate not only the geographical proximity to Bühler, which always guarantees fast support when problems arise, but especially the joint drive for innovation,” Dr. Epple explains. “We have been working with Bühler for over 40 years and we frequently test new developments in industrial environments. Just recently, we tested a novel form of Bühler bead mill technology which has now been launched on the market.”

Show your colors
In the Epple laboratory, Dr. Vroni Walter, Head of Research and Development at Epple, is focusing on a complex chemical pigment structure. Meanwhile, next door, on a Bühler SDY-200 laboratory three-roll mill, pigments combine unstoppably to

Epple produces around 10,000 tons of printing ink per year and delivers to all continents.
Dr. Vroni Walter’s research focuses on new innovations.

“In addition to commercial printing, such as magazines, the importance of printing inks for food packaging has increased substantially.”

Dr. Vroni Walter
Head of Research and Development at Epple

form a red color. Epple is researching new formulations, properties, and above all, more sustainable production of printing inks.

“In addition to commercial printing, such as magazines, the importance of printing inks for food packaging has increased substantially. This has been accompanied by an increased demand for more sustainable packaging and corresponding inks, especially since consumers are no longer just paying attention to what they eat, but also to the way food is packaged,” Dr. Walter explains.

The Doctor of Chemistry appreciates her technically advanced development environment. “To test new composites quickly and reliably before moving into industrial production, we have a miniature version of a Bühler three-roll mill as well as a K8 bead mill in the laboratory,” she says.

Miniature versions for maximum quality

For Mark Traber, Director of Global Sales of Bühler Grinding & Dispersing, this is a very exciting project. “The design of an efficient process solution starts in the lab. We simulated the production lines beforehand on a laboratory scale using dispersion technology for the smallest quantities,” he
“We use around 28 tons of printing ink every year and we need to be able to rely on perfect color quality at all times. Fortunately, with Epple we have a supplier we can trust 100 percent,” explains Daniel Ettlinger, CEO of galledia group ag. “The fact that the printing inks are produced on Bühler systems and that the Diagram magazine continues to complete one exciting virtuous circle after the other between the three companies, is more than just a great anecdote for us. It represents the commitment of Bühler, Epple, and galledia to quality, trust, sustainability, and innovation.”

Perpetual motion

Exactly 6.6 kilometers away, Mark Traber focuses on a color smear at the Grinding & Dispersing Application Center in Uzwil. Traber studies color samples and discusses particle size and gloss properties with his colleague, Frank Tabellion, Head of Process Technology and Product Management.

“This is where we begin the new cycle in cooperation with customers like Epple. Each process optimization is geared to customers’ concerns and requirements. All parties involved will only remain competitive if we listen to them closely, develop solutions together and then test them in the industrial environment,” explains Traber.

Despite all the pressure in the industry, Traber enjoys those moments when he browses through a publication produced with this unique cycle. He draws a clear conclusion: “The developments in terms of sustainable raw materials, efficient production and transparency make me very confident about the future of the printing industry. As in every business sector, we always need to remain agile, recognize trends early on and provide appropriate solutions.” In the future, too, it will be the inexorable drive for innovation on the part of all of those involved that will continue to drive this invisible virtuous circle dynamic.

Everyone is striving to be one shade more subtle, one roller revolution faster, and one color intensity more intense – from the supplier, to the producer, to the end customer, and back again.
Checking the type area is an important process in quality assurance of print products. Here, pages of the last issue of Diagram are reviewed.

A printer’s loupe reveals how the ink lies on the paper, registering colors, dot-gain, and more.

“WE APPRECIATE THAT BÜHLER ALWAYS GUARANTEES FAST SUPPORT WHEN PROBLEMS ARISE, AND WE ESPECIALLY VALUE OUR JOINT DRIVE FOR INNOVATION.”

Dr. Carl Epple looks forward to receiving Bühler’s customer magazine (in German), as it is printed with his inks.
Dan Dye cannot conceal his excitement when talking about Bühler’s latest engineering breakthrough in the field of milling. “Arrius will enable us to deliver the absolutely best flour quality to our customers through precision milling,” says the CEO of Ardent Mills, based in Denver, Colorado in the US.

As the leading milling company in America and one of the top three global producers, he sees Arrius as central to his production strategy across all 33 of the company’s mills. At the heart of his strategy lies the needs of his customers and his employees, along with his goal to continuously innovate. “Arrius is a perfect fit and our people are very excited about it,” says Dye. Ardent Mills has been working as a development partner with Bühler on the Arrius project since 2016. They spent over a year testing a prototype machine. A new Ardent Mill, currently being built in Tampa, Florida, is to be fully equipped with the new Bühler grinding system.

Across the pond is Whitworth Bros. Ltd., a flour milling company based in the United Kingdom. Mike Peters, Managing Director, is equally enthusiastic about the potential impact of this new technology on his business. “We have a really strong passion and drive for food safety, reliability, quality, and consistency. And following the development work we have done with Bühler, and the tests we have run in our plants, we are very satisfied that Arrius can deliver on these attributes.”
Similar to Ardent Mills, Whitworth Bros. Ltd. has also chosen to fully equip its new mill being built in Whitley Bridge, England, with Bühler’s new grinding system.

And in Europe, in what looks to be a growing consensus, Franz Rhomberg, Managing Director of Vorarlberger Mühlen, based in Austria, has also given the new technology a massive thumbs up. “We can only be successful when we are more innovative than our competitors. That’s why we have decided to completely renovate our 200-ton swing-mill with Arrius,” Rhomberg explains. Since 2018, the complete roller floor consisting of 12 Arrius systems has been running at Vorarlberger Mühlen.

Complete redesign

It is no accident that there has been such a high level of industry endorsement for this new technology. Arrius has been developed as the result of a radical rethink that has led to a complete redesign of previous roller mill technologies. “We have been building mills for decades and we realized that if we had wanted to keep running them in the same way, that would mean we had maxed out on all the existing concepts,” explains Stefan Birrer, Head of Milling Solutions at Bühler. “Fully leveraging the potential of digital technologies while also transferring methods from other industries, demanded a complete restart and rethink. It meant we had to embark into green field engineering.”

Every single component of the roller mill has been newly conceived: the roller pack, the drive unit, the feeding module, the switch cabinet, the user interface, safety components, and connectivity elements. There is nothing incremental about these changes to the roller stand. Arrius is the first fully-integrated plug-and-play grinding system, providing an industry step change towards autonomous flour milling. If we were to compare it to driverless car technology, it would be the equivalent of being able to navigate a car through a city on autopilot.

To start with, Arrius provides ultimate flexibility through its new ease-of-use features. It comes with new control systems, an integrated web server, and

Bühler has provided technological advances to the milling sector for 160 years. We heard from industry leaders who have put the Arrius to the test, a Bühler innovation that is set to change the very heart of milling – the grinding process itself.
A remote app that can be uploaded onto a mobile phone or tablet. By selecting a specific grinding system, the app connects to the control system enabling the user interface to be displayed. All of the functionalities of the Arrius control system are also available on the app. “You can monitor and manage each Arrius from anywhere within the mill’s network,” says Birrer.

Then there is Arrius’ focus on hygienic design and safety. The new feeding module is designed for complete product discharge and is fully accessible by opening the inlet door. The design of the grinding chamber has been greatly improved, while increased aspiration reduces product deposits. The machine stand, with its hygienic leveling feet, allows easy cleaning under the machine, also increasing food safety. It goes without saying that all surfaces that come into contact with the product are made of food grade materials. Arrius has also set a new benchmark in operational safety by providing an electronically lockable cover and hand guard protection.

**A multitude of breakthroughs**

The first breakthrough came with the decision to integrate the switch cabinet and the drive unit. Traditionally they are both mounted separately. Bühler decided to integrate these two components and thus radically simplify the mechanical installation and electrical wiring needed. The new technology only requires three electrical connections, one for the electrical supply, one for data and a third for the emergency shutdown signal. A conventional machine normally requires well over 10 different wiring connections.

The most innovative development of the Arrius technology is in the design of the feeding module and roller pack. For the first time, the flow of the raw material onto the rolls can be fully controlled. The new feeding module with asymmetrical inlet and distribution screw, mixes and distributes the grain evenly over the entire grinding gap. Sensors control the flow independently of the product and thereby guarantee a consistent feed.

The roller pack is pre-stressed and backlash-free, which guarantees a stable grinding process and also optimizes the energy transfer into the product. Another advantage is that the grinding gap is not manually fixed. It means that for the first time the sensors along the roll are able to regulate the force at which the grain is being input and then adjust the size of the grinding gap accordingly in real time. “The interplay of the new feeding module and roller pack allows a new level of precision and performance in milling,” explains Birrer.
Arrius is key to both the Bühler Mill E3 and SmartMill concepts, both of which are providing solutions for millers who are currently facing growing challenges. “And there are many of those challenges ahead,” explains Stefan Birrer. It is not just that the market has become very competitive and price-sensitive, but ever-increasing levels of automation demand greater consistency and higher product quality. The smallest production deviation can result in a loss that goes straight to the bottom line. This is happening as food safety regulations tighten and millers report difficulty in finding properly qualified and skilled staff.

“With Arrius, Bühler is setting a new industry standard for high-end flour milling applications,” explains Dye. Arrius is designed for use in situations when there is a simultaneous need for the highest levels of performance, flexibility, quality, and safety. Arrius complements Bühler’s existing broad grinding portfolio, which provides dedicated equipment, services, and solutions to meet the needs of all types of companies throughout the global milling sector. “High-precision autonomous milling is not a luxury, it will become key to remaining successful in a tough market environment for millers,” explains Birrer.

**FIVE KEY BENEFITS**

- **Efficient, reliable, and safe operation**
  The new feeding and grinding features not only increase output, but starch damage can also be accurately adjusted or even increased by up to 10 percent if required. This is especially important for bakers who wish to achieve high volumes with their breads and other baked goods. Operation and maintenance are greatly simplified. Roll changes can be done quickly and efficiently thanks to the design and tools provided. For the first time Arrius also allows processing grain on one side of the grinding system while the other is still in maintenance. Both help to keep uptimes at the maximum.

- **Energy savings**
  The integrated drive and gearbox provides up to 10 percent energy cost savings. As energy is one of the main cost drivers in a mill, significant savings can be achieved.

- **Consistently high quality and full process control**
  The new feeding module and roller pack allow the operator to achieve full process transparency, while the new connectivity and the self-adjusting features ensure the highest level of consistency.

- **Fast and flexible installation**
  The integrated drive and switch cabinet make Arrius up to three times quicker to install than a conventional grinding system. It also provides users with much more flexibility thanks to it being able to be placed almost anywhere in the mill. As a key component of Bühler’s Mill E3 concept, Arrius contributes to reducing building volume by up to 30 percent.

- **SmartMill ready**
  Investing in Arrius will mean being able to take full advantage of all the digital services and applications Bühler will be rolling out over the next years. Arrius is a key part of the SmartMill, a concept that is moving the industry towards autonomous or “auto-pilot” milling.

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**VIDEO**

Watch this video to learn more about the Arrius integrated grinding system.

The Arrius integrated grinding system is offered in two variants, a four-roll version and an eight-roll version.
With its International Rice Milling Academy in Bangalore, India, Bühler has opened the first school dedicated to rice in the world. The training program covers the entire value chain and brings together rice millers from all around the globe. There, they gain the know-how to optimize their mills for the long term.
GOING WITH THE GRAIN

TEXT: ANJA METZGER
PHOTOS: VENKATESH JAYARAJ
THE NUMBERS show that a school like this was long overdue. In many countries, the most important staple food is not wheat or corn, but rice; and in terms of global production, rice is ahead of wheat. According to the Food and Agriculture Organization (FAO) of the United Nations, rice millers processed 782 million tons of paddy rice in 2018, whereas 734 million tons of wheat were milled in the same year. The wheat milling industry has been training its experts in several milling schools around the world – including Bühler’s African Milling School in Kenya and the Swiss School of Milling. But rice millers have not had this opportunity until now.

“Until recently, rice millers have learned their skills on the job – there has been no official training,” says Dr. Anna Vega, Head of the International Rice Milling Academy (IRMA) in Bangalore, India. “It has always been difficult for rice mill managers to recruit and retain qualified staff.”

Now Bühler is giving customers the opportunity to deepen their knowledge in a four-week course to enable them to optimize their operations. The “Paddy to Rice” diploma course covers the entire value chain from seed to packaged rice. Other key topics include food safety and laboratory tests, as well as theoretical knowledge about cultivation and harvesting.

Hands-on training
The first class of rice millers have already received their diplomas. In November 2019, 10 participants – that’s the maximum class size – had completed the course. The proud graduates stemmed from countries including Nigeria, Myanmar, Indonesia, and the Philippines.

Thanks to the small class size, the participants receive optimal support. Any time practical experience is needed, the class just goes to Bühler’s Bangalore Application Center next door and runs through the processes in the integrated training mill.

When setting up the school, Anna Vega was able to rely not just on the existing facilities but also on expertise in the company. “I work with Bühler employees as lecturers in their specialist fields,” explains Vega. “Technology experts, the head of the Application Center, product managers, food safety specialists, employees from the analytical laboratory – they all contribute by providing their specialized knowledge.”

In order to be able to offer the additional topics of rice cultivation and pre-harvest technologies, Bühler runs the course in collaboration with the International Rice Research Institute (IRRI), which is based in the Philippines. The IRRI is the most acclaimed institution in this field anywhere in the world.
Unlike the milling business, where the miller buys pre-cleaned wheat, the work of a rice miller begins immediately after the harvest. The rice farmer delivers paddy rice in sacks or as loose produce with no drying or cleaning. “This means the rice miller must be able to carry out all the processes himself,” says Mike Häfeli, Head of Grain Quality & Supply at Bühler. Upstream processes in particular have a major impact on the quality and appearance of rice by the time it’s ready to eat. “There’s much more to milling rice than hulling and polishing. For example, we already have an influence on the color of the product when the paddy is dried,” says Häfeli.

Understanding the impact of storage, cleaning and drying on rice ready for consumption can optimize a business in the long term. With every participant who completes the diploma and brings the knowledge back into their company, the school increases its influence on efficiency and resource optimization in the global rice business.

“We sensitize and train rice millers on topics such as food safety, good storage, and pest control,” says Vega. “Especially in countries such as Nigeria, where rice milling has not yet established a tradition, this knowledge allows them to ensure that as little rice as possible is lost in the process chain.”

Addressing market needs
But rice is not just rice: According to the IRRI, there are actually 117,000 different varieties of rice and different regional preferences. In Vietnam, for example, the rice must be white and shiny. In China and Japan, it must be sticky so that it can be eaten with chopsticks. In India, consumers prefer long grain rice like basmati, which doesn’t stick together. With its many years of work in the global rice market, Bühler has acquired process-specific experience for these market needs, from which participants now benefit.

The four-week training allows for intensive exchange between the rice millers. “The conversations they have together during the breaks were valuable, and that goes for me too,” says Vega about the first course. Although all of the participants had experience in the food industry, not all of them had experience in rice milling.

“Even though I had no previous knowledge of rice, I gained enough self-confidence to set up a rice mill in Nigeria,” says graduate Olufunke Baoku of Lifecare Ventures Ltd. in Nigeria. With the diploma, she and her team colleague Benjamin Adukwu acquired the necessary skills to build a rice mill alongside the existing millet and malt plant.

Hands-on training
The first-year graduates are very proud of what they have learned and look forward to putting their studies to use. Neil Jann Sioco from the Philippines says, “It’s not just about grinding. I learned how to handle the paddy rice, how to enhance the flavor, how to increase the shine to meet the customer’s preferences, and how to make sure it’s safe to eat.”

The set-up of the machines in the course was different to what some participants were used to from their own rice mill. “I hope I can implement some of these new findings in my own country,” says Aung Zaw Latt from Myanmar.

There is a high demand for courses at the International Rice Milling Academy. “We had originally planned to run two courses in 2020, but due to Covid-19 and the related challenges in India, the next course dates are still unclear,” Vega says. “Anyone who is interested can contact us directly.”

As soon as the courses resume, more rice millers will be refining their skills to take rice mills around the world to the next level.

**INFO**

**THE PADDY TO RICE DIPLOMA**

**Duration:** 4 weeks  
**Location:** Bangalore, India  
**Content:** All process steps from pre-harvest to finished product, including food and mill safety, rice by-products, and lab analysis  
**Facilities:** Fully-fledged rice mill, modern classrooms  
**Trainers:** Experts from the International Rice Research Institute (IRRI) and Bühler  
**Teaching style:** 60% theoretical, 40% practical  
**Email:** info@internationalricemillingacademy.com

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“THERE IS MUCH MORE TO MILLING RICE THAN HULLING AND POLISHING.”

MIKE HÄFELI
Head of Grain Quality & Supply at Bühler
IN JANUARY 2020, Stefan Lutz returned to Nairobi, Kenya to take up his new position as Managing Director of the African Milling School (AMS). It was a sort of homecoming for him, as he was part of the teaching team when the school welcomed its inaugural class in 2015. He even developed the syllabus and textbooks for the vocational program together with his predecessor, Martin Schlauri. In 2017, Lutz left AMS to take up the position as Bühler’s as Head of Technology in South America.

Back in Kenya’s capital in 2020, Lutz was looking forward to the year ahead. He had big plans to expand the school’s course offerings beyond the two-year courses. The coronavirus thwarted his plans. In March, less than a week after the 28 second-year apprenticeship students from 17 countries had arrived, Lutz had to make the difficult decision to send them all back home – just in time as it turned out. Because the next day, Kenya imposed a lockdown and closed its borders. “Everyone made it home safely,” says Lutz. “The next question was: What are we going to do now?”

How it all began
The AMS was founded to increase grain processing know-how in Africa and the Middle East. “We want to train professionals from the region for the region, and thereby reduce dependence on foreign specialists,” explains Heiko Feuring, Head of Middle East and Africa at Bühler. “The school is therefore open to all companies – regardless of whether they are customers of Bühler.”

The AMS program is based on the Central European vocational training system and fills a gap in the African school system when it comes to this trade. “In our industry, only a few people study at universities,” Lutz explains. “Learning by doing is how most millers learn their profession.”
Lutz regularly sees the consequences of a lack of professional training in the industry, namely machine downtimes due to lack of maintenance and inefficient grain processing with yield and performance losses. “From 100 kilograms of wheat, 77 to 78 kilograms of flour can be obtained with optimum use of technology,” explains Lutz. “If the quota is only 70 kilograms, this has a huge impact on a mill with a daily production of 2,000 tons.”

**Finding the right balance**

Before AMS opened in 2015, the instructor team formulated the syllabus of the Swiss milling apprenticeship program into English, the language of instruction at the AMS. The goal was to offer training that is both well founded and practice oriented in the newly constructed building that would house a school mill, a laboratory with a bakery, and two classrooms. When the very first class began its two-year apprenticeship, a few challenges emerged. “The students were between 23 and 45 years old and at very different levels of knowledge,” Lutz recalls. “Finding the right balance was quite a task.”

In addition to instructing in English, the school also offered tailormade trainings in French, Arabic and now Portuguese – three common languages in Africa and the Middle East.
Until recently, the two-year apprenticeship at the AMS was split into six modules, each consisting of one month of classroom instruction, in between which the students would apply their newly acquired knowledge in their companies.

During classes at the AMS, theory is studied in the classroom in the morning; in the afternoon, that knowledge is applied in the school mill, the workshop or the laboratory. The program covers the path of the grain from cultivation to consumption.

If, for example, proper storage is a core topic in the first module, the training continues from correctly operating machinery all the way to laboratory work. “There, for example, the trainees learn how to detect toxins produced by molds, such as aflatoxin in corn grains,” explains Lutz. “After all, our trainees are also responsible for maintaining the highest standards of quality and hygiene.”

The program is completed with baking bread in the school bakery, since the prospective millers should know how their customers work.

**Better quality, satisfied customers**

To date, around 150 apprentices have completed the two-year training program. Luciana Wambuhga is one of them. She graduated in 2018. The trained laboratory assistant works in a mill in Eldoret in western Kenya and attended the AMS as part of a traineeship. “The start of the program was particularly exciting,” Wambuhga recalls. “After only a short time, we got to know how grain cleaning machines work, how to maintain them and how to adjust them properly.”

Wambuhga and a colleague from the mill where she works, were the only women in the 2017-2018 class, and this fact spurred her on to excel in the program. “I wanted to prove to some skeptical male colleagues that I can do this as a woman,” she says. She did that by finishing second in her class, and her colleague third. “Our mill in Eldoret was very satisfied with us,” says Wambuhga, who was promoted to shift supervisor after graduating. “Thanks to my initiative, we now maintain our machines systematically and regularly.” Wambuhga is especially proud of the fact that, due to her training at the AMS, the flour quality in the company has greatly improved. For example, a sample in the laboratory revealed a gluten content that was too low, and this was elevated by modifying the wheat blend. “Sales are better now,” explains Wambuhga. “Our customers are satisfied.”

When the lessons in March 2020 fell victim to the coronavirus pandemic, Lutz decided to reduce the number of attendance modules from six to four in the future. He and his five team members began developing e-learning content that learners could access via smartphone. “But this move only enables them to acquire basic knowledge,” says Lutz. “The practical training and final touches must take place on-site.” This way, the attendance modules should be more intensive, and the students should spend more time in the school mill and in the lab.

The AMS therefore quickly began to prepare for teaching in the new normal. Dispensers with hand sanitizer, regular disinfection of the premises, and temperature checks at the entrance are now part of the daily routine. When the lockdown was loosened and Kenya reopened its borders and schools, the AMS was able to hold the second and final module of a head miller course that had started in January 2020.

And, the second-year apprenticeship students, who had to leave in March in a hurry, will make up for their missed modules in a six-week intensive course starting in February 2021.
In order to adhere to social distancing guidelines, the class will be taught on the more spacious upper floor of the school mill and the classrooms will be ventilated regularly. The lunch break in the cafeteria will take place in two shifts. “It will be a demanding time for the students,” says Lutz. “But this way they can still complete their apprenticeship.”

Opportunity springs from challenges
As the pandemic might cause travel restrictions for a longer period of time, Lutz has focused the offer of the African Milling School more strongly on the home market of Kenya. “We also have a coffee roasting machine and brewing equipment on the school property, so we’ve designed courses lasting several days on the topic of coffee roasting and beer brewing. The coronavirus crisis caused us to rethink, and we now offer more courses in other production areas,” he says. Next year, the AMS will start a course for feed millers with three one-month teaching modules. The aim is to teach students how to professionally process bran, a by-product of wheat, into animal feed using pellet mills. “We had the idea for this for quite some time,” says Lutz. “However, due to the ongoing miller and head miller classes, we never had time to turn it into reality.”

Including all of the short courses, the school director estimates that in the past five years, around 1,000 people have graduated from the AMS. Thanks to its many modern process technologies, the school has also become a valued partner for local grain producers, especially when it comes to developing advanced processing methods. The AMS also offers flour analyses and advice on quality improvement, for example when a miller receives complaints from customers.

“Over the past five years, the AMS has become more than a school,” Lutz explains. “Today it is a knowledge pool and application center, and we provide solutions for the food industry on the African continent and in the Middle East.”

“OVER THE PAST FIVE YEARS, THE AMS HAS BECOME MORE THAN A SCHOOL.”

Stefan Lutz, the new head of AMS, in the laboratory with students.

Stefan Lutz
Managing Director of the African Milling School

WEBSITE
To learn more about the African Milling School and its programs, scan the code to visit their website.
Everyone’s talking about a new technology in the semiconductor industry – EUV lithography. It uses extremely short-wave ultraviolet light to produce microchips in the tiniest format that can process enormous quantities of data in computers and smartphones. Bühler is playing a role in this development.
A RACE IS on in the semiconductor industry. It’s a race to see who can produce the smallest and most efficient microchips in the world. The growing volumes of data that smartphones and other high-performance computers have to process simultaneously at an increasingly high speed requires the use of microchips whose performance reaches far beyond anything we have seen before. Whichever company is in the lead here determines how the industry will progress.

A breakthrough came last year. Thanks to EUV lithography, the production of such tiny microchips is now possible. EUV stands for “extreme ultraviolet” and refers to light with extremely short wavelengths. These lightwaves can be used to produce more powerful, energy-efficient, and cost-effective microchips. In contrast to the existing lithography, EUV can be used to create structures that are roughly one ten-thousandth of the thickness of a human hair.

Conventional systems won’t do
The performance of microelectronics depends essentially on how many transistors (electronic semiconductor components) are packed into a particular area. This is a rapidly developing area of technology, especially since the packing density has doubled about every two years in the last 50 years, according to Moore's Law (see box).

In recent years, optical lithography was increasingly reaching its physical limits. The leap to EUV lithography was necessary to realize semiconductor structures on the nanometer scale. However, this step required an entirely new way of thinking about how production processes should run. The entire technology, from the light source to the optical system in a vacuum to the surface coating, had to be developed from scratch.

Extreme ultraviolet light is absorbed by air, making it unsuitable for use in conventional production environments. Moreover, this light cannot be shaped and focused by lenses which is the common practice in optical lithography. To avoid this physical problem, researchers at Carl Zeiss SMT have developed a lithographic system consisting exclusively of mirrors. It is adapted for use in a high vacuum, for example, in an environment with almost no air molecules. The mirrors used in this technology must meet extremely high requirements. The requirements for the mirror layers are equally high. They consist of approximately 100 individual layers that are applied with atomic precision. A further decisive factor is that the mirrors need to have a diameter of more than half a meter to make it work.

The Fraunhofer Institute for Applied Optics and Precision Engineering IOF, based in Jena, Germany, is a long-standing customer of Bühler Leybold Optics and one of the key partners in the development of this mirror coating.

Finding NESSY
Dr. Sergiy Yulin has been undertaking research at Fraunhofer IOF for over 20 years on the utilization of extremely short-wave light for lithographic production of microchips. At the beginning of his research, there were no coating systems capable of applying layers with the necessary precision to the required large mirror substrates. Over time, however, it turned out that the Bühler Leybold Optics’ NESSY system made this process possible. In 2009, the Fraunhofer IOF succeeded in producing an EUV mirror with a diameter of 66 cm with the NESSY 2
WE HAD TO RETHINK AND DEVELOP COATING SOURCES AND DRIVE TECHNOLOGY IN A VACUUM ENVIRONMENT."

KLAUS HERBIG
Head of Product Management at Bühler Leybold Optics

“WE HAD TO RETHINK AND DEVELOP COATING SOURCES AND DRIVE TECHNOLOGY IN A VACUUM ENVIRONMENT.”

- an outstanding achievement at the time. Today, the NESSY system is already in its third generation and is used by a number of clients for mirror coating.

**Rethinking and redeveloping**

“When Fraunhofer IOF reached out to us in 2002 with their requirement for precision on large curved substrates, it initially seemed impossible to produce such results. Their requirements for mechanical engineering and process technology had not yet been implemented by any company in the world,” explains Klaus Herbig, Head of Product Management at Bühler Leybold Optics. “We had to rethink and develop coating sources and drive technology in a vacuum environment.”

After approximately 20 years of research and development, the technology is now ready for the market and available for use in the semiconductor

**INFO**

**Moore’s Law** was established in 1965 by the American Gordon Moore, co-founder of Intel. The law states that the number of integrated circuits that can fit on a microchip doubles at intervals of approximately two years at minimal cost.
By the end of 2020, it is expected that around 90 EUV lithography systems will be delivered around the world. The two biggest microchip manufacturers in the world, Samsung from South Korea, along with TSMC from Taiwan, already use them to produce logic chips of the latest generation.

Leading the way through collaboration

This innovation opens up enormous economic potential in a market with annual global sales of tens of billions of dollars. It is not only ZEISS and TRUMPF that will benefit from this development of EUV lithography, which is secured by more than 2,000 patents. It has already created several thousand high-quality new jobs as a large network of companies and research institutes in Germany and Europe that are involved in the project as suppliers or scientific partners.

EUV lithography will lead the way for the semiconductor industry in the coming years. This is also reflected in the fact that the renowned German Future Prize, the Federal President's Prize for Technology and Innovation, was awarded in November 2020 to a team that has made a significant contribution to the development of EUV tech-

INFO

Optical lithography has been the key technology for microchip production for over 40 years. Previous processes used a light source with a wavelength of 193 nanometers. EUV lithography is a photolithography process that uses electromagnetic radiation with a wavelength of 13.5 nanometers, known as extreme ultraviolet radiation. This should make it possible to continue the structural reduction in the semiconductor industry in the future and to produce smaller, faster, and more efficient integrated circuits. The principle here is that the shorter the wavelength of the light, the smaller the structures that can be produced.
On the 2020 German Future Prize website, you will find more information about the winning team from ZEISS, TRUMPF, and Fraunhofer IOF. The German Federal President’s Prize for Technology and Innovation is awarded annually at the end of November.
“IN PRINCIPLE, THIS INNOVATION ALLOWS THE INTEGRATION OF SEVERAL OPTICAL COMPONENTS IN A VERY SMALL SPACE.”

RAINER MINIXHOFER
Head of Technology at ams AG
Sensor technology is developing rapidly. Under the leadership of the Austrian company ams AG, a consortium of European technology providers, including Bühler, has developed the latest generation of sensors. This is a unique market innovation – because these new sensors combine several functions such as aperture, lenses, and filters in a single component in the smallest format.

WE ARE ALL surrounded by countless sensors every day: in our smartphones, our car, the fitness tracker on our wrist, the smart refrigerator, the robot lawn-mower, the intelligent street lighting. The world is largely made up of sensor technologies that are evolving rapidly. This makes our mobile devices smarter, more intuitive, more sensitive and more energy-efficient. And the sensors they contain are becoming smaller and more precise.

The market in this area is driven simultaneously by two factors: on the one hand, there are many high-end solutions in highly specialized areas such as cutting-edge medicine or space exploration; and manufacturers are finding ways to make these solutions accessible to normal consumers by scaling production. On the other hand, such offers create increased demand on the part of end consumers – once a technology has reached the consumer sector, they want it all. And they want it at a reasonable price. This in turn prompts manufacturers to produce even greater quantities at the same time in order to lower prices.

**Multiple functions in the smallest space**

Under the leadership of ams AG, a leading global supplier of high-quality sensor solutions, a consortium of technology companies, including Bühler Leybold Optics, has developed a new high-end solution for the production of such optical sensors. It is the world’s first light sensor that combines multiple filters and optical elements such as lenses and apertures in a very small space. These miniaturized sensors are especially suitable for use in smartphones or wearables, such as fitness trackers or intelligent headphones.

Due to the high accuracy of these optical filters, sensors can also be implemented for precise diagnostic applications. “In principle, this innovation allows the integration of several optical components in a very small space,” says Rainer Minixhofer, Head of Technology at ams AG. “In this way, new types of miniature cameras or fingerprint sensors can be implemented, for example.”

The project of the participating technology companies is called HIOS (Highly Integrated Optoelectronical Sensor) and was co-financed by the European Union under the Horizon2020 grant agreement no. 720531 (Fast Track to Innovation).

“The main contribution of Bühler Leybold Optics to this project was to further adapt the existing coating technology of the HELIOS 800 to the requirements of the semiconductor industry and to further improve productivity,” says Klaus Herbig, Head of
Product Management at Bühler Leybold Optics. “In addition, new optic filters have been developed for future sensors. In this area in particular, Bühler Leybold Optics with its experience in the production of optical layer systems for precision optics has made a significant contribution to the success of the project.”

**Sensors learn to perceive their environment with Leybold Optics coatings. The nanometer-thin layers allow the camera in the smartphone to regulate light irradiation or the intelligent car to view its surroundings at night using infrared radiation.**

“The technology is based on a vacuum coating process known as sputtering. The coating material, usually a metal such as silicon or tantalum, is inserted into the cathode as a tube or disk (target),” explains Klaus Herbig. “In a plasma discharge, individual noble gas ions are generated and accelerated onto the cathode. They then knock out individual metal atoms from the cathode, which are deposited on the filter. The addition of oxygen makes these layers become oxidized and transparent. This creates several nanometer-thin layers of different materials. Depending on the composition, this filter reflects different wavelengths.”

HELIOS technology is now so advanced that the filters produced are able to sort out light waves in a highly differentiated manner. They work in the light spectrum from ultraviolet to infrared by applying up to 800 layers of different optical materials to a filter. Another decisive factor is that a HELIOS system can coat several parts simultaneously, thereby increasing production volumes. This makes the production of the filters much more cost-effective.

**Three times as many filters**

Bühler Leybold Optics has further developed its HELIOS technology in the past three years. The existing HELIOS 800 system has been upgraded to Generation II to enable coatings with virtually no particle contamination.

In addition, the new HELIOS 1200 system has been developed in a way that allows a significantly greater throughput and the coating of larger substrates with about three times as many filters per substrate. With these new developments, Bühler Leybold Optics is able to respond to changing market needs and strengthen its position as an innovator in vacuum thin-film technology. The developments of the HIOS consortium, including the use of the latest HELIOS technology, have produced outstanding

**“BÜHLER LEYBOLD OPTICS HAS BEEN ABLE TO FURTHER DEVELOP ITS COATING TECHNOLOGY FOR THIS SPECIAL AND RAPIDLY GROWING MARKET.”**

KLAUS HERBIG
Head of Product Management at Bühler Leybold Optics

The HELIOS can coat several workpieces simultaneously, enabling higher production volumes.
results in terms of the quality of the optical filters, so that the technology can now be implemented in new sensors for applications with UV, visible and infrared wavelengths.

“Thanks to the participation in this project and the excellent cooperation of all companies involved, we have been able to increase the speed of innovation significantly,” says Herbig. “New sensors were developed to the point of marketability in a shorter time, and Bühler Leybold Optics has also been able to further develop its coating technology for this special and rapidly growing market, thereby enhancing its competitiveness.”

After coating, the filters can emit light waves in the UV, visible and infrared range.

More information can be found on the HIOS Project website at www.fti-hios.eu

With the latest generation of HELIOS technology, silicon wafers up to 300 millimeters in size can be coated.
Bühler has been using food sorting technology to improve plastic recycling efficiency, creating the sort of advances that will help cut the amount of plastic waste found in our environment and reduce greenhouse gas emissions.
But it's not just the heart-wrenching images of sea creatures entangled in our plastic waste that poses an environmental threat. Making plastic is extremely energy intensive. Recycling plastic water bottles takes 88 percent less energy than making one from scratch. Research published last year by scientists at the University of California, Santa Barbara, calculates that by 2050 plastics will account for around 17 percent of the entire global carbon budget. If we want to cut greenhouse gas emissions and reduce plastic pollution in our environment, we will need technological advances to help improve those global recycling rates. This is an area that Bühler has been involved in for over 30 years.

**Shift in technology**

Bühler first entered the plastic recycling business in 1987 when it sold an optical sorter to DuPont de Nemours in the Netherlands. Thanks to its scale, the food manufacturing sector has always been technologically ahead of the waste industry. When recycling companies discovered that Bühler technology, designed for food manufacturing could also be used for sorting plastics, it had a dramatic impact on the market.

“It was a big surprise for everybody,” explains Bühler Head of Segment Plastic, Bernhard Gabauer. “We were taking sorting technology used in the food sector and we had immediate success, whether you measure throughput capacity or sorter accuracy. We were three times better than the competition, which meant that any customers using our machines were generating a third higher profits each year than competitors.”

From the time a water bottle is thrown into the recycling bin it will undergo many different sorting and washing processes before it can be reused. The final stage involves plastics being shredded into flakes of up to 25 millimeters in diameter and then undergoing a final sorting process to eliminate any last contaminants before being prepared as a new raw material. Bühler's Sortex technology provides the final stage of this process. “We are the last guardians to make sure that the final product is pure plastic and therefore ready to be remanufactured,” explains Gabauer.

**Evolving optical technology**

The key to that success is the permanently evolving optical technology used in Bühler's Sortex machines. The team based in London, where the sorters are manufactured, therefore puts great emphasis on research and development. “Every couple of years we have new camera technology with higher and higher resolution, which improves efficiency and performance, so it is a process of continuous development,” explains Gabauer.
In 2016, Bühler made a second significant technological breakthrough in the recycling market with the launch of its Sortex E PolyVision flake sorter, which had been designed for polyethylene terephthalate (PET) recyclers. The plastic recycling industry is awash with acronyms describing different plastic types suitable for different functions.

PET is a strong and lightweight plastic used for packaging foods and beverages and is the most commonly recycled plastic. It can also be used for mouthwash, liquid soaps, and cooking oils with special grades of PET capable of being warmed in ovens or microwaves. It is the plastic we are all most familiar with when it comes to the packaging in our supermarket shop.

The advantage of PET is that it is the easiest form of plastic to recycle and consequently the closest to achieving what is known as closed loop recycling. That is the ability to collect the waste, recycle it and make it into a similar product thus resulting in minimal impact on the environment. While the optical sorting technology was, in the past, able to detect color variations and sort contaminants such as wood, paper, or metal, the PolyVision technology can distinguish same-color polymer contaminants by analyzing their chemical signatures. Much like a fingerprint, different plastics have a unique surface texture that can be detected by PolyVision’s high-definition cameras.

The new technology can detect a clear PET flake from another type of clear plastic such as polyvinyl chloride (PVC). This was a significant breakthrough for the plastic recycling industry. A contamination level of just 50 parts per million of PVC in a batch of PET flake risks the new end product becoming brittle and yellowish in color and therefore worthless.

**Total sorting solution**

Using two optical sorters, recyclers have a complete solution. The PolyVision technology sorts any contaminating polymers while the ColorVision technology sorts color streams and other contaminants such as woods or metals.

The technology can also be used for other plastic types such as high-density polyethylene (HDPE), which is also used for food containers, wraps and squeezable containers, and polypropylene (PP), a hard plastic used in car parts and Tupperware.
“THIS IS A MARKET THAT IS GROWING AND BÜHLER’S SORTEX IS STILL AT THE CUTTING EDGE OF TECHNOLOGICAL DEVELOPMENTS TO TAKE ADVANTAGE OF THIS GROWTH.”

BERNHARD GABAUER
Bühler Head of Segment Plastic

Conventional sorting solutions typically rely on either transmissive or reflective sorting. Bühler solutions use both methods simultaneously.

Food-grade recycled PET requires the highest purity. Bühler’s Sortex solutions ensure that customers can recycle at higher grades.
the volume of plastic waste collected for recycling in Europe increased by 79 percent, while plastic incinerated for energy recovery increased by 61 percent, with plastic going to landfill falling by 43 percent. Countries such as Switzerland, Austria, and Germany have imposed strict landfill restrictions and tighter regulation, meaning that plastic recycling targets are only set to go up. In the Netherlands, a Plastic Pact agreement between government and industry has set a target of 70 percent recycling of disposable plastic products by 2025.

According to the Plastics Europe research, even EU countries with the least stringent landfill regulations such as Greece, Bulgaria, and Croatia are still recycling around a fifth of their plastics. And the plastic recycling rate across Europe is 30 percent, based on statistics from the European Environmental Agency. This still leaves plenty of room for market expansion, but according to Gabauer, he expects the next real area of growth to come from America. “If you consider that a recycled plastic product in Europe is more or less 80 percent made from recycled plastic, in America that recycled content drops to about 25 percent, so you can see how America offers huge potential for growth,” explains Gabauer.

In the same way that the sophisticated cameras used in the food sector provided an efficiency leap for the waste industry, the next major source of innovation to come from the food sector is likely to be around digitalization. Gabauer believes the sort of services now being made possible by the digital platform Bühler Insights, which uses algorithms to optimize production parameters, will be easily transferable when it comes to plastic recycling.

“As long as you can grind it down into flakes, generally speaking, we can sort it and you can recycle it,” Gabauer explains.

Specialist plastic recycling companies make up most of Bühler’s customers, but the equipment can also be used in more bespoke situations. An example is the UK-based specialist recycling company Penfold Plastics, which was struggling to cut away rubber seals from unplasticized polyvinyl chloride (UPVC) windowframes. The answer was to shred the entire frame and then use the Bühler technology to extract the shredded rubber.

Discovering 30 years ago that machines designed to distinguish discoloration of raw food materials could be used to sort plastic flakes was a “happy coincidence” for Bühler, says Gabauer. Since then, China has shifted into green industries, including the manufacture of plastic sorting technology, making today’s sorter market far more competitive, indeed. This is a market that, according to Gabauer, is growing between 7 and 9 percent annually.

Future market growth
This market growth is in part down to the firming up of legislation around recycling rates in response to rising levels of environmental plastic pollution. Leading the way is Europe. Plastics Europe estimates that in the 10 years between 2006 and 2016, 105
... that about 8 percent of the world’s oil production is used for the production of plastics? By 2050 this share is expected to increase to 20 percent.

... that up to 88 percent of energy is saved when new products are made from recycled PET? The recycling process uses a much smaller amount of energy than so-called primary production.

... that the plastic pollution of soil and inland waters is between four and 24 times higher than in the sea, depending on the environment?

... that less than a fifth of all plastics worldwide are recycled? At 30 percent the proportion is highest in Europe.

... that Europe’s first color sorter for plastics recycling came from Sortex (now Bühler Sortex)? The machine was delivered to the Netherlands in 1987.

... that, depending on the product, it takes hundreds of years for plastic to disintegrate into ever smaller particles, and it has not yet been scientifically researched whether it will ever really disintegrate completely?

... that about 8 percent of the world’s oil production is used for the production of plastics? By 2050 this share is expected to increase to 20 percent.

... that Bühler sorting solutions today enable a closed loop? For example, new bottles can be produced again and again from old PET bottles. If, after a few cycles, the material no longer meets the high quality standards of the food industry, it can still be used for other products, such as textiles.

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I have experienced, has tested our company, our industry, and each of us as individuals. The digital journey was accelerated beyond imagination and resistance to new technologies disappeared over night as a result of the pandemic. The sustainability agenda, particularly the role we play in the climate change race, has come under the brightest spotlight, with many companies making their carbon neutral ambitions public.

As a company, we have focused our innovation where we can bring impact, developing new services and connecting more plants around the world to our Bühler Insights platform. We have accelerated our program to quantify our role in reducing waste, energy, and water in our customers' value chains by 50 percent. I would like to share three activities that highlighted resilience and adaptability.

If we want to bring impact, widespread collaboration is key. And yet, removing the face-to-face meetings, eliminating the handshakes, the coffees together, and the serendipity of the water cooler moments presents challenges to relationship building. In May, we launched our first Bühler Virtual World with speakers addressing the short-term need for resilience and the requirement to accelerate the development of sustainable solutions. We showcased new technologies and with an emphasis on services, remote support, connectivity and the role we can play in supporting sustainable and resilient business in our industry. Over 16,000 unique visitors from 132 countries attended the event. We knew that with digital technologies we could connect, engage, collaborate, and drive business.

In June, we asked our employees to propose ideas that would reduce energy, water, and waste in our customers' value chains by 50 percent and generate good business for Bühler, our partners, and our customers. We were overwhelmed: 7,000 employees engaged, over 4,000 voted for the idea they wanted accelerated, and 418 ideas were submitted by teams of four to five people.

Eight ideas were selected and accelerated online during an intensive three-week program. Finally they pitched to our Executive Board and six have received funding to prove their business cases. The engagement of our employees, the spirit of innovation, and the focus on sustainability made the Innovation Challenge 160 a fitting way to celebrate the 160th birthday of the Bühler company.

The MassChallenge start-up accelerator, a non-profit, early-stage start-up program funded by corporate partners, thrives on collaboration. It selects the best start-ups and brings them together to compress about 12 months of a start-ups' life into a 4-month acceleration phase. This year, everything went digital.

In Switzerland, we had almost no face-to-face meetings, and yet the impact was extraordinary, with more start-ups of higher quality, more partnerships created, more corporate partners engaging, and significant focus on sustainable business development. For just one short extra program in Switzerland, 470 start-ups who play a role in creating a more sustainable food system applied from across the world. Start-ups brought inspiration, but also viable solutions for global issues such as plastic recycling, microplastics replacements, sustainable proteins, biodegradable packaging, shared mobility networks, authenticity verification of foods, CO\textsubscript{2} capture, and many more.

I have chosen three examples from this year, but could have picked many others. What underpinned these was a common desire to innovate, to unlock potential, to create businesses, and, above all, a common purpose to provide an improved quality of life for all the world’s inhabitants within the limits of our planet’s resources.