feeling good about food

THE STRUCTURE OF HEALTHY FOOD: interview with Nestlé’s Stefan Palzer

THRIVING IN A COMPETITIVE MARKET: a perfect partnership with Bocar

PROCESSING INSECTS FOR PROTEIN: a sustainable industry is born
Feeling good about food

Bühler Networking Days
2017 @ Interpack
Feeling good about food

May 4–10, 2017
Düsseldorf, Germany

Visit us at booth D24/D28

www.event.buhlergroup.com
Bühler is changing. The “diagram” issue in your hands and our appearance at the Interpack trade show in Düsseldorf in May are proof of the pudding. Where we once placed emphasis on single machines and technologies, we are today presenting comprehensive process solutions – such as from grain to finished bakery product, from cocoa bean to chocolate bar, or from coffee bean to roasted and ground coffee – and topics such as food safety are always a focus. We are increasingly fine-tuning these processes by taking advantage of all the methods and tools that digitalization offers as well as an extensive range of services. For example, we invite you to use our online portal MyBühler to order wear and spare parts through the internet. And this is just the first step – more digital offerings are in the pipeline.

You can also see how we are changing our positioning by the fact that we no longer seek and develop solutions on our own – but together with you, our customers, and many other partners from the industry and the scientific community. Last year, we took this new approach for the first time with our Bühler Networking Days in Uzwil. The acknowledgment that you expressed for this event has encouraged us to continue along this road. That is why we are calling our trade show appearance “Networking Days 2017 @ Interpack”.

At the center of our Networking Days philosophy is the question of how we can develop our businesses profitably and sustainably. We are all aware of the immense challenges we are facing – the protein gap, obesity, malnutrition, and climate change are just a few topics. These challenges also promise enormous business opportunities. Together with you, we plan to make sustainability and profitability entirely compatible. “Feeling good about food” is therefore our Interpack motto. We can offer a taste experience second to none with top-quality products, make good money while doing so, and do the right things – sustainably. We warmly invite you to share this path with us.

Kind regards,

Stefan Scheiber
CEO Bühler Group

Dear Readers,
# FOCUS

**Feeling good about food**  
Why do we buy and eat certain foods? Science says we are ruled by taste.

**How we experience taste**  
Our eyes, nose, mouth, and brain work together for a full taste experience.

**Interview with Stephan Palzer**  
The R&D expert at Nestlé explains how the company makes food even healthier.

**Today’s nutritional challenges**  
How Bühler helps clients make snacks and processed foods more nutritious.

**Chocolate**  
- From cocoa beans to chocolate delights  
- Learn to be a smooth operator

**Bakery**  
- From grain to flour to wholesome bread  
- Rising to the occasion

## Coffee
- From the fruit to pure coffee bliss  
- Roast potential to infinity and beyond

## Snack bar
- From grains and nuts to snack bars  
- The all-rounders

**Interview with Johannes Wick**  
The head of Grains & Food shares his views on how Bühler stays competitive.

**Partners in Food Solutions**  
How virtual volunteers make a difference for food producers in Africa.

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Raising rice quality
A Vietnamese entrepreneur brings her country’s rice into the premier league.

Thriving in the car market
The Mexican Bocar Group increases its productivity with Bühler training.

Interview with Wilhelm Baum
The CEO of Bocar is determined to work sustainably for his grandchildren.

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We’ve got it wrapped
Clever new food packaging solutions protect sensitive goods at low cost.

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Latest innovations

The birth of an industry
Bühler launches a joint venture to process insects for animal food and feed.

Did you know?
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Food for thought
Bühler’s Chief Technology Officer on how we transform through networking.
Feeling good about food

Food is life. It sustains and nourishes us, and it’s intrinsically tied to our moods and emotions. We reach for certain foods because they make us feel good – they can trigger physical happiness or psychological comfort. But, the foods that gratify us emotionally aren’t always good for us. What motivates us to make certain food choices? And, can we be enticed into make healthier decisions?

TEXT: MICHÈLE BODMER
Understanding how people make decisions and what factors influence those choices is Michael Siegrist’s passion – especially when those decisions are about the foods we consume. As a psychologist and Professor of Consumer Behavior at the ETH Zurich, he and his team focus much of their research on this topic, which is why his department is part of the technical university’s Institute of Food, Nutrition and Health.

He believes that knowing why people eat what they eat is increasingly important given the multiple challenges the world faces relating to nutrition – the overweight and obesity epidemic, the increasing demand for food from a growing global population, and the overarching need to advance healthy, sustainable nutrition.

We eat what we know
We are influenced by a multitude of factors when we decide what to eat: a food’s taste, texture, color, smell, and appearance are all important, but so too are our habits, culture, personal experiences, media, and social stimuli. Though all of these come into play on some level, the list of our main influences is short – it’s a combination of taste, culture, and habit. “Taste is still the number one impetus for our food choices. We judge food on whether it tastes good to us,” explains Professor Siegrist. “Then a lot comes down to the culture in which we are embedded. People tend to eat what they know.”

Habits go hand-in-hand with culture, which is why we find different food patterns in different countries and regions. For example, in some cultures people eat breakfast, in others they don’t. Some eat very late, some early. These habits exert a strong influence on the pattern of our consumption. We tend to eat the same limited range of foods day in, day out. We might sometimes deviate from our patterns, but to do so takes concerted effort. “We don’t rethink our food behaviors every day,” says Siegrist. “People are very conservative when it comes to their food behavior. They might try out new foods, but they won’t substitute bread for rice, if that’s what they prefer.”

Eating healthily is important to us
On average, our habits override our best intentions and even our stated preferences, according to studies carried out by Siegrist and his colleagues. “Changing our eating habits is hard because so many decisions are made automatically in response to the routine situations we find ourselves in, because of our culture, and most importantly because when we like the taste of something, we stick with it,” he says. It’s for these reasons that food behaviors change very slowly.

If you ask people, “Would you like to have a more healthy diet, or are you interested in learning more about how to eat more healthily?”, just about everyone will say yes. We do this because other answers suggest that we don’t care about ourselves, explains Siegrist. However, even when people are aware that their diet is not healthy, the majority of those still don’t act to change what they eat. Yet the fact that they don’t is not a sign that they aren’t concerned about the healthiness of food.

Siegrist’s research shows that, for the majority, eating healthy foods is important – regardless of what they actually eat. His studies also reveal that when people say they are eating more healthily, what they tend to mean is that they are eating specific foods that are healthy, rather than looking
at their full diets. Unfortunately, this is not enough. “If you eat just one single food that is healthy this won’t make a huge difference to your overall health,” Siegrist explains. “What’s important is the total composition of your diet. This isn’t very spectacular or easy to sell. Selling the big picture is harder than selling specific products.”

People tend to choose individual products whose health benefits are emphasized and focus on these as the solution to healthy eating, when in fact, if our diet in general is balanced, we don’t need to worry about also eating the odd chocolate bar.

**The power of perception**

While taste is still the number one factor behind most food choices, there are other strong drivers. In recent years we have seen the market for organic food increase. According to Siegrist, it is primarily beliefs and perceptions that influence these choices. He found that consumers purchased organic foods for their perceived health benefits. “They believed pesticides to be harmful and bought organic foods to avoid them,” he explains. Other reasons for buying organic food were secondary. “Environmental concern is an add-on, but the most important factor was their health.”

The organic label has established its place in the market and has a significant impact on consumer choices, but it is not the only label that successfully appeals to consumers’ interest. In another study, Siegrist and his team examined the effect of “free-from” labels. They looked at a range, including foods that are marketed as free from gluten, lactose, genetically modified ingredients and palm oil.

Consumers in the UK, France, Poland, and Norway were presented with two generic products, one of which bore a free-from label. “Products with free-from labels – free from GMO, palm oil, gluten or lactose – were perceived as healthier compared with products that do not have such a label,” says Siegrist. They are attracted to what they perceive as the naturalness of free-from products.

Once we get into the territory of perceived “naturalness”, it becomes clear that many of the beliefs consumers hold about food are based on little understanding of how food is actually produced and why. “Natural” tends to be seen as the opposite of “processed”, and processed food is therefore associated with being “unnatural”.

In this belief network, the benefits of food processing are lost from sight. People forget or do not see that a major reason for food processing is the increase it brings to food safety – which clearly also has a big impact on our health. “Food industries must produce foods that are processed in a safe environment. Meanwhile, in recent years, consumers want to believe that their food is produced in traditional ways. A lot of marketing underscores this misconception,” says Siegrist. For food manufacturers, changing these perceptions is a major challenge, and opportunity.

**Relying on our senses**

There are people who consciously set out to know and understand more about everything they eat – people for whom food is a defining part of their lifestyle. Yet such extremely health-conscious consumers remain a niche market. For food manufacturers wanting to reach the broader consumer segment, the best approach is to rely not on our intellect but on our senses. According to Siegrist, taste will always have a stronger draw for consumers than health benefits, which is something manufacturers should consider in their marketing. “Frankly, consumers associate less salt, less sugar, and more fiber with less taste,” he says. “But if sugar and salt can be reduced with technology while maintaining taste, consumers will continue to buy the product.”

People will always prefer food that tastes good. But, if it’s also a healthy choice, we can feel good about food in every way.
To eat or not eat?

The American Heritage Dictionary tells us that taste is: a) the sense that distinguishes the sweet, sour, salty, and bitter qualities of dissolved substances in contact with the taste buds on the tongue; and b) this sense in combination with the senses of smell and touch, which together receive a sensation of a substance in the mouth. There are, in fact, two more tastes in addition to the classic four: the taste of fat and a taste called umami, which means delicious in Japanese. It’s also the word for the savory taste of meat. On top of that, the look of something also plays a key role in whether we will eat it – the color and visual appeal of a food translate into a perception of flavor. Another factor in whether we eat something is our emotional association with it – this might even override what our eyes and nose are telling us. Remember when Grandma made you finish your vegetables? Experiences such as these may determine whether we want to taste something again.

Our eyes, nose, and mouth are designed to tell us about the nutritional qualities of the food we eat.

The six tastes:
- sweet for ripe fruit and carbohydrates
- sour for unripe fruit and vitamin C
- salty for salt and other minerals
- bitter for poisonous plants
- umami for protein
- fat for flavor, calories, and polyunsaturated fats

Foods and beverages

Uptake of sensory impressions

Source: The Taste Science Laboratory (www.tastescience.com). Author: Virginia Utermohlen Lovelace MD, retired Associate Professor at Cornell University in the Division of Nutritional Science, New York.
FOCUS / Nutrition

THE BRAIN PERCEIVES FLAVOR

A. Smell and the brain
Smell messages reach two parts of the brain’s temporal lobe: 1) A part involved with memory, which is why smells can call forth such powerful memories. 2) And a part involved with speech. Smelling some perfumes can actually inhibit your ability to speak or even think in words.

B. From tongue to brain
Three nerves carry taste messages from the taste buds on the tongue and in the throat to the brain stem. The trigeminal nerve, which has branches throughout the mouth and nose, carries messages from the touch, temperature, pain system. The nerves combine signals and deliver their message to an area in the brain stem involved with arousal.

MOUTH AND TONGUE

Taste cells throughout the mouth and throat cluster to form taste buds. Isolated taste buds are scattered on the surface of the palate and throat, but on the tongue, the taste buds are grouped in specialized structures called papillae. The number of papillae differ in each person.

Signals received are then processed in the brain

As taste and trigeminal messages move further through the brain, they join up with smell messages to give the sensation of flavor, which feels as if it comes from the mouth.

To eat or not to eat
It is not enough knowing what the flavor is. We also need to react emotionally to what we are eating: Do we like it? Is it poison? Should we enjoy it or spit it out? Therefore, flavor messages also go to the emotional centers involved in giving sensations an emotional coloring, helping us to decide what to eat or not to eat.
Interview

The science of health and taste

Nestlé has committed to reducing the amount of salt, fats, and sugar in the foods it produces, without compromising on taste. With the largest R&D network of any food company in the world, it’s at the forefront of food science and technology innovations. Stefan Palzer, Director of the Nestlé Research Center in Lausanne, tells us how the company is contributing to a healthier future.

Mr. Palzer, what are the most fascinating projects you are working on at the moment?

There are quite a few exciting ones. You might have heard about a major breakthrough our scientists have made, to structure sugar differently, so that we can use less of it in chocolate while maintaining an almost identical taste. Another fascinating area is the microbiome, the vast colony of microbes that inhabit your gastrointestinal tract. It seems that this “forgotten organ” plays really a huge role in how we interact with food. It stimulates the immune system, keeps pathogenic bacteria under control, metabolizes food constituents, and even, somehow, communicates with the brain, which is called the gut-brain axis.

Why is understanding the microbiome important for Nestlé as a food producer?

The 2–3 kilograms of the microbiome consists of more bacterial cells than the number of human cells in our body. It seems that we are a human “fermenter”. We have just begun to understand the interaction of these bacteria with our body. Now the exciting question for a food producer is: How can we impact the microbiome in the right direction to promote health?

Is healthy food currently the most important trend in the industry?

Nestlé’s purpose is to enhance quality of life and contribute to a healthier future. Part of this is to create products that enable healthier and happier lives for individuals and families. We know that people want healthier foods that taste great, with more natural ingredients. Good nutrition is now recognized more and more as the key driver of long-term health outcomes, and consumers are paying more attention to it.

What are the key factors for improving the nutritional profile of certain products?

Basically there are two ways. Firstly, by reducing sensitive nutrients as fast as possible. Reducing sugars, sodium, and saturated fat in our foods and beverages, and also removing all trans fats which originate from partially hydrogenated oils (PHOs) are all key aspects of our commitment to provide...
“Our long-term goal is to help adjust taste preferences so people crave less sugar, salt, and fat in their diets.”
FOCUS / Interview Stefan Palzer

“Our purpose is to enhance the quality of life and contribute to a healthier future.”

healthy and tastier choices. And secondly, to fortify food with special micronutrients to optimize their value.

Let’s talk about the reduction of health-sensitive nutrients first. What have you achieved so far in terms of sugar reduction and what are your future goals?

By the end of 2016 we had reduced our added sugar content by 8 percent, which is equivalent to 39,000 metric tons. Obviously, we want to take this even further by continuously renovating our products without compromising on taste. Our long-term goal is to help adjust taste preferences so people crave less sugar, salt, and fat in their diets. We have just announced a new commitment to reduce the sugars we add in our products by a further 5 percent to support individuals and families in meeting global recommendations. We aim to achieve this even more significant reduction by using the different technologies we’ve developed over the years.

You have reported a new technology with the potential to reduce sugar in chocolate by up to 40 percent – how does it work? And when will you launch these new products?

Using only natural ingredients, we have been able to change the structure of sugar particles so that they dissolve more quickly on your tongue when you eat them in a bar of chocolate. This delivers a sweet sensation more quickly than before, allowing us to use less total sugar in the product, but maintain an almost identical taste. We will begin to use the faster-dissolving sugar across a range of our confectionery products from 2018 onwards.

Nestlé is not only addressing sugar, but also fat and salt. What are your goals here, and how are you addressing them?

We’ve already achieved significant reductions in fats and salt and we’ve announced new commitments to go even further. For example, by 2020 we’ve committed to reducing the sodium we add in our products by 10 percent to support individuals and families in meeting global recommendations. One of the major ways we will achieve these objectives is by applying the principles of materials science. This could involve replacing fats with healthier microstructures that mimic the sensory properties of fat droplets or molecules.

You mentioned the importance of materials science. Can you elaborate on this?

Replacing health-sensitive nutrients with alternative ingredients is challenging. Some sweeteners taste a bit metallic or linger on the tongue longer,
which people don’t like. We think a more effective way to reduce ingredients such as sugar or salt is through materials science. If we can modify their structure so that we only put in the amount of molecules needed to stimulate the taste buds, we can use less of them in our products.

An example from home cooking illustrates this approach: If you boil pasta and you put salt into the water at the beginning, the salt will diffuse into the pasta without any effect on the flavor. If you put the salt on the pasta after you have removed it from the water, it will stay on the surface so you can taste it. It’s the same with sugar in confectionery. When you eat a bar of chocolate, about 80 percent of the sugar never touches a taste bud, but it goes into your gastrointestinal tract anyway. We want to find ways to expose the sensory system to the taste people are looking for, but with less of that ingredient, and without replacing it with something else.

Is food structuring also important to increase the effect of health supporting micronutrients? Definitely! With food structuring we can adjust how and when the nutrients are released into the gastrointestinal tract. And the beauty of food structuring is that it’s not a chemical transformation that many consumers don’t want. It’s all physics, using known, natural ingredients.

What role will fortification play in future to make food healthier, and what is Nestlé doing in this regard?

An estimated 2 billion people – over 30 percent of the world’s population – suffer from deficiencies in essential vitamins and minerals, especially the “Big 4”: iron, iodine, vitamin A, and zinc. These deficiencies disproportionately affect infants, young children, and women, preventing them from achieving their full potential in life. At Nestlé we believe we have a responsibility, as well as an opportunity, to improve the nutrition status of people at risk by adding relevant micronutrients to foods and beverages consumed regularly by these vulnerable populations.

Can you give a specific example?

We made a public commitment to reach 200 billion micronutrient-fortified servings of foods and beverages annually worldwide by 2016, which we achieved – delivering 207 billion servings last year. Our Maggi bouillon cubes, for example, are one of our most appreciated and widely available products in a number of African countries. They are fortified with iodine and iron. Other good examples are our fortified dairy-based products sold under the brands Bear Brand and Nido. We are also working on new concepts for affordable nutrition, as cost remains the major challenge for many people.

Stefan Palzer

Stefan Palzer has been Director of the Nestlé Research Center (NRC) in Lausanne, Switzerland, since October 2016. The NRC focuses on discovering science-based solutions for tasty and nutritionally balanced food and beverages, and effective nutrition and health care products.

In 2013 Stefan was appointed Global R&D Director for Nestlé’s Beverages business, in the Strategic Business Unit for Beverages in Vevey, Switzerland. From 2010 to 2013, he was Managing Director of Nestlé’s Global Product Technology Center for confectionery in York, UK. From 2007 to 2010, he was Department Head for Food Science at the NRC and Head of the 12 Nestlé Food Science and Technology Networks. From 2000 to 2007, he held various positions in Product Technology Centres for Nestlé’s food business in Kemptthal, Switzerland, and Singen, Germany, including Project Manager, Team Leader, and lastly Manager of the Technology Department.

Stefan holds a PhD in Process Engineering from the Technical University of Munich, Germany. He is a Professor for Process Engineering at the Technical University of Hamburg and an Honorary Professor for Food Technology at the University of Stuttgart, Germany. He is also a Visiting Professor of Chemical Engineering at the University of Sheffield, UK.

“By the end of 2016 we had reduced our added sugar content by 8 percent; equivalent to 39,000 metric tons.”
Besides improvements via this approach, will we see more customized diet programs to increase health?

Absolutely. Consider this scenario: You are in a hospital with a broken arm. The patient in the next bed is recovering from a heart attack. Whereas it might be beneficial for you to get food enriched with calcium and possibly vitamin D, your fellow patient might instead benefit from a different set of nutrients, such as healthy oils. In most cases, patients get the same food, but it is feasible to support recovery with tailored nutrition. We are already active in this area. Our Nestlé Health Science business has a medical nutrition portfolio that includes products and services for patients with specific dietary needs related to illnesses, disease states or special challenges of different life stages.

How far can this tailored nutrition go?
The ultimate goal is the optimal diet for every individual, or “personalized nutrition”. The data from sensors and devices in our daily lives, such as mobile phones, wearables and “smart” homes, can help us understand our nutrition and activity, and guide us towards a healthier lifestyle. Our long-term aim is to combine this increasingly connected technology with breakthroughs in nutrition science, to provide people with greater ownership of their quality of life.

You hold multiple professorships. How do you balance this along with running basic research for the world’s biggest food and beverage company?
Well, I give lectures at each university a couple of days a year so that my time engagement remains manageable. The engagement with academia, working with students and having discussions with leading scientists, always inspires me and provides me with new ideas. It also allows me to identify young talent and hire them at a later stage.

Have the skills that graduates need to succeed changed? And, are we preparing them adequately to face the health challenges of the future?
I would say so. Today’s graduates are expected to have an excellent basic education, and to speak at least two languages fluently. In the meantime, they need to be able to apply their knowledge to addressing new challenges and sometimes even global ones. They have to be capable of dealing with an increasing amount of unstructured “Big Data”, which they need to leverage in solving these problems. In order to succeed they have to be entrepreneurial and passionate about what they do, while being able to handle increasing complexity in a fast-changing world.
Today’s discerning pet owners want healthy, safe, premium options for their four-legged family members.

From raw-material handling to grinding and extrusion to drying and coating, Bühler offers a complete line of processing solutions that meet demanding industry requirements. Find out how we stack up.

Got a question? Contact us.
nutrition@buhlergroup.com

There is no trick to making petfood safe.
The taste and nutrition challenge

Around the world, snacks and processed foods are an increasingly popular part of people’s diets. Making these foods more nutritious, while retaining the tastes and textures people like, requires innovation and expertise. Bühler is working with food manufacturers to meet this challenge.

TEXT: JANET ANDERSON
Whether in the West, Asia, South America or Africa, challenges are emerging in the way we feed ourselves. People’s diets are made up increasingly of highly processed food. While these products offer diversity, taste, convenience and other advantages, there are also drawbacks. “One of the key health challenges that we see globally is an increase in the number of overweight or obese people,” explains Nadina Müller, Nutrition Program Manager at Bühler Group.

Consumers, too, are becoming increasingly aware of the health impacts of what they eat and want to make changes. In response, some countries are introducing schemes to help consumers understand quickly and easily the nutritional value of the products they buy. An example is the voluntary traffic light system in the UK, where foods are labeled as red, amber or green according to how much salt, sugar and fat they contain. Other countries are going further and debating whether to introduce sugar taxes.

Meanwhile in emerging economies, overnutrition issues are just beginning to appear. In China a nutrition transition is underway and obesity is on the rise. “It’s a prime example of how fast economic growth can lead to a shift of dietary habits over less than a generation,” explains Jascha Ell, who is a management trainee at Bühler and also a trained medical doctor. Global developments such as urbanization and the growing middle class go hand in hand with a shift in the types of foods people eat. While there are many gains from buying processed foods in supermarkets – including safety, convenience and taste, from a nutritional perspective there can also be disadvantages if this means eating less fresh fruit and vegetables and replacing water, tea, and coffee with soft drinks. Couple this with other changes like the move away from physical labor to a more sedentary lifestyle, and we can see why obesity starts to be a problem.

Today, 1.9 billion people are overweight and about 600 million are obese worldwide. That’s 39 percent of all adults and 14 percent of all children and adolescents. Overweight and obesity creates health risks such as type II diabetes, cardiovascular disease and many forms of cancers. Diets that are deficient in dietary fiber and high in sugar content are one cause of overnutrition. Yet highly processed food is likely to remain a cornerstone in the global food system.

Finding the right balance
Many food manufacturers recognize this challenge and are developing products that are both tastier and healthier. Their aim is to offer consumers the taste and texture they prefer but with less sugar. This is essential because if healthier alternatives don’t meet the consumer’s preferences, consumers are likely not to choose them and may stay with less nutritious alternatives.

“We have to face the fact that people tend to eat fewer structured meals and rely more on on-the-go snacking, so the nutritional content of snacks has become more important, while the taste and texture remain as important as ever,” says Müller.

According to a survey by Mintel in 2016, 75 percent of US consumers would like healthier snacks, but taste remains the key decision criterion. “For established food categories, people still want their products to look and taste the same, putting food producers in a quandary. This is one reason why we have made nutrition a core pillar of our long-
term research program and why we are working on solutions to answer these challenges.” Sugar is only one part of the story. Children and adults need at least 20 to 30 grams of dietary fiber a day for good health, but highly processed foods often do not contain enough. The challenge is to make these foods healthier while not affecting taste and texture.

**Solutions that match consumer preferences**

Bühler offers various solutions addressing this challenge. For example, Bühler countlines give snack producers the flexibility to add a variety of different ingredients that enhance the snack’s nutritional value while retaining taste and other qualities that are important for consumers.

“Our countlines can produce the entire range of snack bars from chocolate caramel bars to products with nuts, dried fruits and seeds, helping food manufacturers add less sugar and more fiber to their products while still meeting consumers’ expectations. We also support our customers in finding the right processing parameters for their newest recipes,” says Müller.

While these solutions enable the introduction of more fiber into new and existing products, it’s equally important to retain fiber levels when the production process for traditional products is industrialized. Take flatbreads, for example, which are enjoyed in different forms in many parts of the world. Bühler has developed an industrial solution to produce whole-grain flour for Indian flatbread – thus retaining the nutritional benefits of the whole-grain while making production more efficient. The solution can be tailored to match local taste and preferences in other regions as well.

“We are making headway, but there is still more to do,” says Ell. In order to maintain momentum Bühler not only invests in building in-house expertise – gathering data, running trials and constantly investigating new methods and materials – but also collaborates with academic institutions to push research further and explore new types of products that could help solve these challenges. Strong links to universities such as the Swiss Federal Institute of Technology (ETH Zurich) and the École polytechnique fédérale de Lausanne (EPFL) mean that Bühler is at the forefront of coming up with new solutions.

“It’s not just know-how but know-why,” Ell explains. “In order to work out what kind of new machines we need to develop, we have to have discussions with our customers in order to understand the root causes of these challenges and also which solutions will be a success with end consumers. By coupling our know-how with that of our customers, we can answer these questions.”

Bühler is in a unique position to make a real difference because food produced on its technologies serves more than half the world’s population every day. “With this position comes responsibility. It’s one thing just to provide calories and another to provide the right nutritional quality and meet people’s lifestyle preferences at the same time.”

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**In-house expertise**

Bühler’s Nutrition Program Manager Nadina Müller leads the company’s long-term R&D program on nutrition. She has a Master in Food Science and a Doctor of Sciences from the ETH Zurich. Her focus is on developing healthy yet tasty food options.

Jascha Ell first trained as a medical doctor before joining Bühler as a management trainee. At medical school he carried out research into the long-term effects of overnutrition on fat. He brings to Bühler an interest in how nutrition and behavior work together.
Healthy alternatives for convenience meals and snacks.
From cocoa beans to chocolate delights

A great conquistador brought cocoa to Europe, where it was enjoyed only by the wealthy as a drink. Over time, inventive Europeans found ways to process the beans into an array of chocolatey treats for everyone.

TEXT: MICHELLE BODMER / INFOGRAPHIC: DANIEL RÖTTELE

Cocoa beans make their way into many products

More than 60% of all chocolate products worldwide are produced with Bühler solutions, which span the entire processing chain. The beans are processed into cocoa powder, butter, and liquor, then, they either go into making chocolates or other products. Cocoa shells are also not wasted. They are used for garden mulch. Extracts from the antioxidant-rich shells may soon be used in foods and beverages.

Sources: Euromonitor International & ITC; ICCO Quarterly Bulletin of Cocoa Statistics; Bühler; Barry Callebaut; Nestlé Cocoa Plan; Statista; "Chocolate: A Bittersweet Saga of Dark and Light", 2006; Fairtrade; Mind Lab Study 2007. Contributors from Bühler: Thomas Bischof, Niklaus Gutgsell, Gospa Tesic, Gabriel Würth, and Marco Zappa.

A brief history of chocolate from Columbus to Bühler

1502: Christopher Columbus is the first European to come into contact with cocoa but doesn’t realize its importance.

1528: Cocoa finally reaches Europe thanks to Hernán Cortés. It becomes a fashionable drink for the Spanish court.

1500 1600 1700 1800 1810 1820 1830 1840 1850 1860 1870

1819: François-Louis Cailler opens the first mechanized chocolate production facility.

1867: Henri Nestlé creates condensed milk and milk powder, which would come to change the taste of chocolate.

1828: Coenraad van Houten invents a press to remove cocoa butter from processed cocoa, leaving fine, powdered chocolate.

~ 500 B.C.: The Mayans cultivate cocoa for their favorite drink of crushed cocoa beans, chili peppers, and water.
Where does cocoa grow?
Cocoa trees grow only 20 degrees north and south of the equator.

Major cocoa producers
2015/2016* in 1,000 metric tons of cocoa beans

Ivory Coast: 1,740
Ghana: 820
Indonesia: 330
Cameroon: 250
Ecuador: 230

90% of the world’s cocoa is grown by small-scale enterprise. Many have succession issues, as younger generations don’t see a future in growing cocoa. Meanwhile, the average age of today’s farmers is 50.

Who’s eating chocolate?
Pro capita consumption by country in kilograms, 2015

The cocoa tree and its fruit
A tree needs 4 to 7 years to produce fruit and grows about 40 cocoa pods a year. A pod has 20 to 75 beans. 500 cocoa beans make a pound of chocolate.

Worldwide consumption of chocolate in 2016 reached 7.37 million tons. If you translate this amount into 100-gram chocolate bars and stack them, you could build a 192-meter cube. The London Eye, Europe’s biggest ferris wheel, is just 135 meters tall by comparison.

Cocoa types from robust to regal
Share of global production, 2015

80% Forastero
The most robust with many subspecies.

15% Trinitario
A hybrid of the Criollo and Forastero.

5% Criollo
The king of cocoa is the most difficult to grow.

Chocolate causes a buzz in your brain and body that can last four times longer than passionate kissing. Chocolate contains phenylethylamine which can raise your endorphin levels. Endorphins induce feelings of pleasure.

1879: Rodolphe Lindt invents the conching machine to steadily mix and aerate liquid chocolate for a finer flavor.

1875: Daniel Peter makes the first milk chocolate by adding Nestlé’s condensed milk.

1919: Bühler constructs its first five-roll chocolate refiner. It not only makes chocolate finer and tastier, it also increases output.

1960: The Bühler double-overthrow conche is a breakthrough from traditional longitudinal conching with higher batch capacity and huge time savings.

2000: Bühler Cool-Core cold stamping technology opens up new possibilities for forming chocolate shells with precision.

2007: Bühler expands its cocoa processing offer with roasting technologies that enable 500 unique flavors to unfold.

2015: Bühler enters the countlines business, adding enrobing and filling to its solutions.

Bühler has expanded its face-to-face educational platforms with a new, self-paced online learning service designed to help chocolate line operators carry out their job more effectively. The ChocoGenius service isn’t a replacement for on-site training, it’s part of a blended-learning approach that combines web-based training with classroom instruction either at Bühler or at a customer location.

“We offer a variety of training options because we want our customers to be able to make the most of their investment into our equipment, and their workforce,” explains Marco Zappa, Head of Business Unit Chocolate Mass. “The ChocoGenius is an innovative Bühler solution that will allow our customers to efficiently bring their staff up to speed on our machinery.”

The standard base of training and troubleshooting support that ChocoGenius offers is ideal for starters, but even chocolate line operators with years of experience will learn some new tricks of the trade. By implementing ChocoGenius, customers can be sure that their employees worldwide are receiving exactly the same high-quality training and that they will work from the same knowledge base to address standard issues that may crop up during daily business.

What’s the point of such uniform instruction? “The systematic approach to training results in efficient knowledge transfer, more effective troubleshooting, and ultimately improved product quality,” explains Patrick Strähl, Senior Process Engineer and ChocoGenius Project Manager. He has been developing this project with the chocolate technology team since 2015.

An intuitive, visual solution
The team initially placed a lot of emphasis on determining not only what the tool should encompass, but also on making it easy to use and motivating. “Because we have customers around the world, it was important to create a universally understandable, intuitive, and visual solution,” Strähl says. This is why the service has just two pillars:

Learn to be a smooth operator

How can you support your chocolate line operators on their path to becoming chocolate geniuses? With a combination of interactive online learning and on-site instruction. Bühler’s ChocoGenius enables customers to offer “anytime, anywhere” web-based training to their employees.

TEXT: MICHELÉ BODMER / PHOTO: LUKAS NAEF
FOCUS / ChocoGenius

“In the future we would like to include the full chocolate process.”

Marco Zappa

learn and work. “Learn” is a systematic, video-based training section that explains the ins-and-outs of a mixer, a two-roll refiner, and a five-roll refiner. “Work” is the area where operators can find solutions to specific problems. For example, a decision tree pops up when a problem has been identified. Then, either explanatory videos appear that address the specific issues, or in some segments a simulator function appears. In this case, the operator can then choose an action that will create a reaction in the simulator. With this trial-and-error approach the user learns to make adjustments to get to the right solution in this safe, virtual environment of ChocoGenius.

Apart from the ability to offer line operators a consistent base of knowledge, customers will also benefit from the reporting features of the service. This reporting function is one of the biggest advantages of online learning as it provides information that will help managers understand what areas were the most troublesome for operators. “With data analysis it’s no longer necessary to guess where the learning curve of your employees is,” explains Strähl. “Customers can then address knowledge gaps with very specific, customized on-site training. This will make the classroom instruction much more efficient and less time-consuming.”

ChocoGenius was test-driven in early 2016 with the help of customers. Experienced line operators took part in reviewing the service and their feedback led to important refinements. It also helped the team to see they were on the right track. “The best feedback we received was from a line operator with 40 years of experience. He said that he enjoyed learning this way and that ChocoGenius was almost as good as having a Bühler trainer at his side,” says Strähl.

State-of-the-art training

The web-based service has been officially launched at Networking Days 2017 @ Interpack, and more modules are being planned as well as translations into multiple languages. Further down the line, the team hopes to give the customers the opportunity to upload their own videos in the “decision tree” segments in order to customize the tool for their specific needs.

“Bühler develops state-of-the-art machinery and we want our training offering to be equally advanced, which is why we will continue to expand ChocoGenius,” Zappa explains. “In the future we would like to include the full chocolate process, from bean to bar, and even other confectionery applications.”

Would you like more information?

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ADDED VALUE
+ Self-paced learning, anytime, anywhere
+ Efficient, consistent knowledge transfer
+ Improved troubleshooting
+ Better product quality

Patrick Strähl and Marco Zappa test ChocoGenius.
From grain to flour to wholesome bread

Bread has strongly connected people across the ages. We gather to “break bread” and forge relationships. Whether a snack or a main component of a meal, we love our daily bread.

TEXT: MICHAEL TREMP / INFOGRAPHIC: DANIEL RÖTTELE

Bakery Innovation Center (BIC)

BIC connects millers and bakers through its knowledge of grain processing and baking technology. It’s a unique testing environment for all stages of the baking process—from the intake of raw materials to the final baked goods. BIC works to improve and develop bakery products with new technologies and helps clients consistently create top-quality products. Since 2012, more than 3,000 customers have been trained at the center.

The largest industrial bakery for which Bühler provides ingredient handling produces 470 tons of bread a day—the weight of 4 Boeing 787 Dreamliners.

35% of grain and 65% of wheat worldwide are processed with Bühler equipment, and about 2,000 tons of bread and biscuits are produced every hour around the globe.

Mega trend: ancient grains

Sources: Euromonitor International; Mintel market research; welt.de; ugb.de; Bühler Bakery Innovation Center. Contributors from Bühler: Michèle Bodmer.
With close to 140 million metric tons, baked goods is the second largest packaged food category following dairy.

Eating two slices of whole grain toast a day can reduce the risk of Type 2 diabetes by almost 20%.

Mega trend: gluten-free goods. Gluten is a protein found in wheat, rye, barley and their crossbred varieties. Gluten allergies, intolerances or sensitivities impact about 1–2% of the global population, yet the gluten-free foods category reached sales of USD 11.6 billion in 2015 — with growth of about 20% a year.

**JetMix for high-quality sponge and sourdough**

Industrial scale bakers are increasingly relying on sponge and sourdough because of their positive baking characteristics. The JetMix creates workable dough with good machining characteristics, reducing kneading time by up to 30%.

**The JetMix principle:** Various nozzles create a water mist that ensure each flour particle is uniformly moistened, improving water retention. The result is a creamy sponge dough – just like one would expect from traditional, artisanal techniques.

**Who's buying the most bread?**

Retail volume, kg per capita, 2015

**North America**

- White bread (soft crust)
- Rye bread

**Southern Europe**

- White/whole wheat bread (crisp crust)
- Steamed bread (buns)

**Asia**

- Tortilla, arepa
- Steamed bread (buns)

**Africa**

- Flatbreads (often cooked or deep fried instead of baked)

**South America**

- Tortilla, arepa
- Flatbreads (Pita/Naan)

**Southern Europe**

- White/whole wheat bread (crisp crust)

**Middle East / India**

- Flatbreads (Pita/Naan)

**North America**

- White bread (soft crust)

**Northern Europe**

- Rye bread

**Asia**

- Steamed bread (buns)

**Africa**

- Flatbreads (often cooked or deep fried instead of baked)

**South America**

- Tortilla, arepa

**Middle East / India**

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**Asia**

- Steamed bread (buns)

**Africa**

- Flatbreads (often cooked or deep fried instead of baked)

**South America**

- Tortilla, arepa

**Middle East / India**

- Flatbreads (Pita/Naan)
Although people have been doing it for thousands of years, processing flour remains a demanding task. Millers and bakers alike want consistent flour quality, but getting there is an art and a science. “Grain is a living, organic raw material,” explains Markus Schirmer, Head of Bühler’s Bakery Innovation Center in Uzwil, Switzerland. “Because every grain is different, the individual batches of flour are also different. Small bakeries can deal with this because the bakers use their experience to even out the differences in the ingredients. However, for large companies that need highly-automated and standardized solutions, this variability poses quite an issue.” This is where the experts at BIC’s competence center for flour processing can help.

From grain to bread

In order to provide its customers with the necessary knowledge and equipment to take on such complex challenges, Bühler founded the Bakery Innovation Center in Uzwil in 2012. Thanks to its strategic expansion, it has since become an application and training center for the full industrial production of baked goods. Under the slogan “from grain to bread” Bühler’s knowledge is being fused along the whole value chain in the course subjects. “In our standard courses we explain what influence the grinding has on the quality of the baked goods, we introduce the ‘secrets’ of industrial baking, and share information about the use of pre-ferments and sourdoughs,” says Schirmer.

Thousands of clients trained at BIC

BIC works to improve and develop bakery products with new technologies and helps clients consistently create top-quality products. And word has gotten around that it’s more than worth a visit to BIC.

Since 2012, more than 3,000 customers have been trained at the center. It’s the ideal place to combine theory and practice. “Our course participants want to learn which settings they should change on their machines and systems in order to

Rising to the occasion

The Bakery Innovation Center (BIC) at Bühler’s headquarters is one-of-a-kind worldwide. It covers baking knowledge from A to Z – from processing grains to the analysis of finished products and to the development of baked goods. BIC is being expanded to include a bakery application area which opens in July.

TEXT: HERBERT BOSSHART / PHOTO: LUKAS NAEF
achieve the same end product with varying raw materials,” Schirmer explains. “Industrially produced bread should taste great and get closer and closer to hand-crafted bread in terms of quality.”

Sharing basic knowledge about the interplay of the recipes and technology is at the core of the courses rather than the actual baking process. “You can only develop ideas for new products and processes and react to problems in production once you understand the basics,” explains Schirmer.

Developing the application area

BIC has expanded in the last few months with the addition of an application area. With this expansion, it has become its own baking technology center. The opening ceremony takes place in July this year. With its complete process line, it offers the chance to carry out every stage from receiving the raw materials right up to analyzing finished baked goods. In the expanded BIC, both medium as well as industrial companies can carry out trials on an industrial scale.

Customers use the BIC primarily to develop new products, but also to test solutions offered by Bühler before investing in them. With the development of the application area, the training program has also been expanded. “In this new environment we offer courses on the whole procedure of producing baked goods – from handling all the ingredients, producing the dough and all the way up to the oven.” The knowledge provided in the BIC is not just interesting to bakers, but also millers. In fact, BIC connects the two with knowledge of grain processing and baking technology.

“The trend to bake without additives in particular is pushing the milling process even further into the spotlight,” Schirmer says, a master baker himself and an engineer. With this trend toward naturalness, flour quality now has to manage what was once regulated by additives.

Core operations

The Business Unit Bakery and Ingredient Handling from Bühler has, over the last years, turned into a comprehensive partner for industrial bakeries. The Bakery Innovation Center offers all systems and processes from complete raw material preparation to the dough. Bühler also provides facilities for sustainably using waste bread. Complete systems for manufacturing premixes and ready mixes, for flour heat treatment (FHT) as well as manufacturing breadcrumbs complete the portfolio.

www.buhlergroup.com/bic

ADDED VALUE

+ Expanded application and training centers
+ Inspires innovation through enhanced course offering
+ Consistent quality across end products
+ Test facility with complete process lines

Would you like more information?

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From the fruit to pure coffee bliss

Coffee is more than a beverage, it's a lifestyle. It's a social activity that has become part of local culture. Worldwide, 2.5 billion cups are consumed daily, and that number is growing.

TEXT: BIANCA RICHLE / INFOGRAPHIC: DANIEL RÖTTELE AND MICHAEL STÜNZI

The different stages of beans on their journey into your coffee cup

Cultivation
The fruit of the coffee tree is cherrylike and contains two seeds – the coffee beans. Newly-planted coffee trees first bear fruit after three to four years. Robusta and Arabica are the two most cultivated types.

Harvesting
The coffee fruits are harvested by hand. It takes a coffee picker 20 to 30 minutes to finish one tree. Each picker harvests between 50 to 100 kilograms of fruits a day. That's about 10 to 20 kilograms of coffee beans.

Post-harvest and shipment
There are two ways to remove the beans from the fruit. In wet processing, the fruits are immersed in water and the pulp is removed. In dry processing, the fruits are dried in the sun, then the dried outer layer is hulled to reveal the green bean. The green beans are then shipped to various countries for processing.

The largest producers
In 2015, global coffee production amounted to 8 million metric tons. Coffee grows in over 70 countries. The four largest producers provide over 60% of the global harvest.

2015/2016 harvest yields in million metric tons

<table>
<thead>
<tr>
<th>Country</th>
<th>Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>2.59</td>
</tr>
<tr>
<td>Vietnam</td>
<td>1.65</td>
</tr>
<tr>
<td>Colombia</td>
<td>0.81</td>
</tr>
<tr>
<td>Indonesia</td>
<td>0.74</td>
</tr>
</tbody>
</table>

Social considerations
The price of coffee is highly volatile due to fluctuating harvests. In Fairtrade-certified cooperations, farmers can count on a minimum price of USD 1.40 per pound of coffee.

The biggest coffee fans
Per-capita consumption in 2015, in kilograms of green coffee

<table>
<thead>
<tr>
<th>Country</th>
<th>Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finland</td>
<td>12.2</td>
</tr>
<tr>
<td>Sweden</td>
<td>10.1</td>
</tr>
<tr>
<td>Norway</td>
<td>8.8</td>
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<tr>
<td>Austria</td>
<td>7.8</td>
</tr>
<tr>
<td>Switzerland</td>
<td>7.7</td>
</tr>
<tr>
<td>Germany</td>
<td>7.2</td>
</tr>
</tbody>
</table>

Sources: Quellen: Tchibo, “Kaffee in Zahlen” 2012 und 2014; National Coffee Association USA; Fairtrade Foundation; Max Havelaar; mayoclinic.org (Is coffee good or bad for me?); Stanford Medicine; Euromonitor International. Contributors from Bühler: Stefan Schenker, Gospa Tesic, and Gabriel Würth.
**Cleaning and sorting**

A Sortex machine only takes a few hundredths of a second to determine whether a bean is good or bad. It can sort up to 10 metric tons of green coffee beans per hour, which is important because a single undetected “stinker bean” can ruin the flavor of several hundred kilograms of coffee.

**Beverage preparation**

The calcium and magnesium content of the water, the water hardness, is crucial for the final flavor when making coffee. If the water is too hard, it neutralizes the acids, and if it is too soft, these become too prominent. The ideal water hardness is 8 to 9, with an ideal pH of 7.

**Grinding**

It is crucial that the particle-size distribution in the ground coffee powder is consistent to maintain a high-quality product, especially for coffee in capsules. The continuity must be ensured across the whole production process.

**Blending**

A blending specialist mixes coffee blends from various varieties of beans. It takes years of experience to work in this highly-specialized field. For particularly high-quality coffee blends, the individual coffee components are only mixed once they have been roasted.

**Roasting**

Roasting unleashes the taste of coffee. Up to 800 flavors can unfold in one coffee bean with the right roasting profile. A few tenths of a degree difference in the final temperature setting determine the degree of roasting. This is visible from the lighter or darker color.

**Health benefits of coffee**

Drinking coffee may help you live longer: Researchers at the Stanford University School of Medicine in the US have discovered that drinking coffee can protect people from age-related cardiovascular diseases, cancer, and Alzheimer’s.

4–6 cups a day are ideal to receive the health benefits of coffee.

**Megatrend 1:**

The convenience, individuality, and simplicity of capsules and single-portion systems are appealing to more and more consumers in developed coffee markets.

**Megatrend 2:**

Coffee culture is blossoming among the Asian middle class, and themed, specialist cafes are increasingly en vogue. 2,040 new coffee shops opened in Asia in 2015.

**Megatrend 3:**

Small, local roasting companies are the new favorites for coffee lovers. The craft of roasting is experiencing a new boom – and gourmet and special roasts are fashionable.

Global coffee consumption has doubled over the last 40 years from 4.2 million metric tons in 1970 to 8.7 million metric tons in 2015.
Roast potential to infinity and beyond

Coffee aficionados are hungry for new and more exquisite taste sensations. Bühler can cater to the needs of even the most discriminating palates with its InfinityRoast. This innovation can bring out a world of flavor in every bean.

TEXT: BIANCA RICHLE / PHOTO: LUKAS NAEF

Roasting is a vital step in the production of coffee. It’s where flavor comes to life. Up until a few years ago, the temperature curve for roasting coffee was given little attention. Set the hot air temperature, put in the beans, and wait until the desired shade of brown has been reached. The roaster had almost no influence, or very little influence on the development of the temperature in the product. Thanks to the Bühler InfinityRoast, this is a thing of the past. The temperature curve can now be controlled as desired.

Temperature curve influences the flavor
Experiments have shown that the flavor is not just affected by the roast time and end temperature of the beans. In fact, the profile of the temperature curve has a considerable impact on the flavor. Simply by changing the temperature curve, the same raw materials at the same degree of roasting and with the same roast time, it is possible to create unlimited flavor profiles. For example, if an Arabica blend is roasted using a traditional temperature profile for 12 minutes at a medium grade, it produces a balanced and more mild aroma. However, if you keep the temperature low in the first phase of the process and raise it more quickly in the second phase, it results in a more powerful flavor with a more prominent, pleasant acidity in the same roast time and degree of roasting.

“The trick is that the resulting color is exactly the same in both variations,” says Stefan Schenker, Head of Business Unit Coffee at Bühler, enthusiastically. With the InfinityRoast, it is possible to create an unlimited amount of different “roasting profiles”. “This is what makes the difference compared to conventional roasting,” adds the coffee expert, who moved from Nestlé’s center for excellence for coffee to Bühler in 2010 and has been driving the coffee business for Bühler since then.

Every capsule exactly the same
Even the physical characteristics of the bean can be controlled exactly with the profile of the temperature curve and also adjusted to the final product. For capsule coffee, which is showing growth in double figures each year, the consistent distribution

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| 32 | diagram #175
Feedback from the market has been as positive as you might expect. Caffè Chicco d’Oro is one of the first companies to choose InfinityRoast and is impressed by its performance. “The consistency in quality achieved in daily production is unique,” Schenker adds.

As a result of positive feedback, Bühler has made the InfinityRoast series available for all capacity requirements and equipped it with optional pre-warming units.

of particle sizes in the ground coffee is crucial. Perfect coffee at the push of a button is only possible with perfect particle size distribution. The precise interaction between the hot water and the coffee during extraction plays an important role in the flavor. “With the InfinityRoast we can get the best out of every raw material,” adds Schenker.

**Perfection for tried and tested recipes**
Schenker is certain that “innovative, unconventional roasting profiles are the future”. This is why Bühler engineers have been working on perfecting the InfinityRoast for three years. The roaster controls the heat transfer to the coffee beans meticulously over the whole roasting process and automatically corrects it if there is the slightest deviation from the target profile. This allows any desired roasting profile to be reproduced exactly.

With the InfinityRoast, deviation from the target profile means less than one degree Celsius. Customers appreciate that they can quickly achieve flavor matching to established products with this new technology and that when changing recipes frequently, they can achieve their desired flavor in the first batch. “This allows our customers to reproduce their trusted recipes exactly,” Schenker is happy to mention.

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**ADDED VALUE**
- Inspires product innovation with unconventional roasting profiles
- Control over flavor development
- Rapid and efficient flavor alignment with established products
- Deviation from target profile < 1 degree Celsius
- Energy savings of 15–25% by using the pre-warming unit

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Would you like more information?

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From grains and nuts to convenient snack bars

A snack bar is an all-purpose food. As the speed of daily life picks up, so too does the demand for on-the-go snacks. Anything labeled “all-natural ingredients” or “rich in protein and fiber” virtually flies off the shelves.

TEXT: ANJA METZGER / INFOGRAPHIC: DANIEL RÖTTELE

Creativity without limits:
a thousand ingredients for snack bars

The base for snack bars can be vastly different. To meet new consumer trends, producers have begun including superfoods such as quinoa and shifting their ingredient list toward fruits and nuts.

1. Processing of raw products
Before snack bars are produced, their ingredients are either processed on Bühler machines or are purchased.

Oat
The unique flavor of oat flakes comes from the hydrothermal process known as kilning. A combination of moisture, temperature and time ensures the reduction of germ levels and gives the oat its nutty flavor. The flaking mill creates the flat flake shapes.

Quinoa
Quinoa seeds are high in protein and gluten-free – a healthy alternative for traditional cereals. For maximum food safety, the seeds are sorted with high-speed cameras that detect any seed that doesn’t have the right color or size.

Rice
Snack bars often contain rice in the form of rice crispies. These expanded products are processed on an extruder. Under pressure as high as 60 to 120 bar, rice flour, water, and other ingredients are mixed, kneaded, cooked and finally pressed out of the extruder. The instant loss of pressure forces the mass to expand to crispies, which then need to be dried to lower the moisture content from 8% to 3%. Big extruders such as the PolyTwin produce up to 2.5 tons of rice crispies per hour.

Nuts
Nuts are an increasingly popular ingredient. The roasting process is essential for bringing out the best flavors in the nuts. The nuts also go through a steam pasteurization process. This is a kill step for germs which also ensures a long shelf life.

2. Mixing
Mixers, such as the Contimix, mix the raw products with the sticky binder to get a uniform mass.

The average snack bar contains these ingredients
Percentage of the most important ingredients of a snack bar, worldwide average

- 32.3% Sweeteners
- 25.6% Cereals
- 7.8% Fats and oils
- 6.3% Flours
- 5.2% Proteins
- 4.3% Fruits
- 4.2% Fruit juice
- 4.1% Polysaccharides and oligosaccharides
- 2.4% Nuts

35%–45% of a snack bar consists of the binder.

Most binders are sweet, including sugar slurry, caramel, chocolate, marshmallow.

Another option is fat-based binders, which is usually a mixture of compound or chocolate with cereal.

For a healthier and less sweet option, tasteless and sugar-free protein hydrolyzates or starch serve as binders.

Sources: Euromonitor.com; Nielsen Global Survey of Snacking 2014; Contributors from Bühler: Thomas Bischof, Marcel Ramseyer, Carsten Petry, Mike Beckert,
**FOCUS / Snack bars**

### North and South Americans like it sweet

Average percentage of all kinds of sweeteners in snack bars, selection of countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>10%</td>
</tr>
<tr>
<td>Germany</td>
<td>22.9%</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>25.7%</td>
</tr>
<tr>
<td>Spain</td>
<td>29.1%</td>
</tr>
<tr>
<td>United States</td>
<td>35%</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>40%</td>
</tr>
<tr>
<td>Brazil</td>
<td>43.6%</td>
</tr>
</tbody>
</table>

### Fruit and nut bar market grows fastest

Total value growth of snack categories worldwide, from 2011 to 2016, in percent

- Cereal bars: 10% growth
- Sweet biscuits: 25.7% growth
- Tortilla chips: 29.1% growth
- Popcorn: 35% growth
- Other snack bars: 43.6% growth
- Fruit and nut bars: 22.9% growth

### Cereal bars are still bestsellers

Worldwide sales of snack bars in USD, 2016

- 6.6 billion Cereal bars
- 3.5 billion Power bars
- 1.4 billion Fruit and nut bars
- 0.7 billion Other bars

### Bühler snack bar lines are designed for high capacities

The output ranges from the smallest lines with up to 60 bars per minute to the biggest lines with 2,500–3,000 bars per minute.

### 4. Cutting

Sharp circular knives cut the long side, while a guillotine knife cuts the short side for uniform shapes.

### 3. Forming

The mass is mainly formed into a slab or extruded into a strand onto the feeding belt.

### 5. Enrobing

For a chocolate finish, the Chocobat enrober coats the snack bars with liquid chocolate.

### Convenience is king

In 2016, consumers spent USD 12.2 billion on snack bars worldwide, which is USD 326.1 million more than in 2015.

### Americans are world champions in eating snack bars (303,600 tons per year), leaving Canadians (50,200 tons) and Britons (44,300 tons) far behind.

### You can have too much of a good thing. Be aware of calorie bombs: seven average protein bars at 70 grams (280 kcal) equal the entire daily calory intake of an adult.

### Healthy snack bars are winners: Snacks with all natural ingredients are rated very important by 45% of consumers and still moderately important by 32%.

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Isabelle Huggler, Gospa Tesic and Gabriel Würth.
A bar is perfect for when hunger strikes between meals. Many people also reach for this convenience food as a meal replacement. The cereal bar trend emerged in the nineties in the US where mass production began. Ever since, snack bars have been a growing market. The demand in emerging markets – particularly in Asia – and the trend toward healthy snacks in established markets such as Europe and North America is driving growth.

Compared with the entire snack market, fruit and nut bars, along with high-protein energy bars are the most popular by far. For example, sales of energy bars rose by 150 percent between 2011 and 2016. This means the power food is beating other popular snacks such as popcorn and biscuits by a long way. However, conventional cereal bars are no longer the big hit they were back in the day – consumers want healthier alternatives.

New Countlines Business Area

The health trend is also having a positive impact on Bühler: Since October 2015, it no longer only offers snack manufacturers pre-production processes such as grain and nut processing or extruding – with the acquisition of Hosokawa Bepex – market leader in the snack bar market in the US – the portfolio has been complemented with the most important bar processes: mixing, shaping, cutting, and enrobing. With its center for excellence for confectionery in Leingarten, Germany, Bühler can also offer expertise in areas such as chocolate, biscuits, caramel – and bars.

One of the initiators for the acquisition was Thomas Bischof, who is the current leader of the Business Area Countlines which resulted from the acquisition. As a long-term marketing manager for Consumer Foods at Bühler, he knows the requirements. “Our customers are not only interested in efficiency – it’s also about appearance and taste,” says Bischof.

It’s also about trends. The good thing is: you can make a bar from just about anything. When it comes to recipes for bars, there are few creative limits. The only essential thing is the binder, which shapes the bar and holds it together. Depending on local preferences, producers can also add other ingredients and flavors. Traditional
FOCUS / Countlines

“Our customers are not only interested in efficiency – it’s also about appearance and taste.”

Thomas Bischof

grains can be quickly replaced with gluten-free superfoods such as quinoa or buckwheat, and sugary binders, such as chocolate or caramel, with honey, fat or protein-based ingredients.

**Natural ingredients instead of E numbers**
Producers try to package health and flavor into one product in the most complementary way possible. “Natural” is the word of the day. More and more producers are working with natural flavorings and natural ingredients, because consumers are clamoring for anything that is “all natural”. Real apple pieces, banana chips or freeze-dried berries, among others, are replacing artificial fruit flavorings and E numbers. Real fruits are just as effective for flavor and sweetness. “The fruity sensation, for example, makes up for the relatively plain flavor of oats,” explains Bischof.

Bars and similar convenience products are no longer just for between meals, they have also established themselves as a quick alternative at traditional meal times. Snack producers can make use of this: diet bars for lunch, protein bars before and after exercise. It is no longer taboo to eat them at any time of day. Snack bars have become part of everyday life. This is the main reason that the market is growing so quickly.

The confectionery industry is practically crisis-proof. But that’s not the reason why Bischof describes his task as Head of the Business Unit as his dream job. It also has something to do with the positive attitude of his employees: “When I walk into a confectionery factory, I have such a feeling of satisfaction – a basic, positive attitude,” he says. “That has a lot to do with the final products. People can really identify with them.”

**Successful integration**
Despite a slow start in 2016, Bischof is optimistic for Countlines. The integration of the newly acquired firm happened to his full satisfaction. “The former Hosokawa-Bepex employees identified with Bühler straight away,” says Bischof. “It made sense for them, that as confectionery specialists they are now also part of the process-specialist Bühler.”

Opportunities to drive growth of the new Business Unit and to discuss new trends with customers include trade fairs such as Interpack in Düsseldorf, which is a trendsetter for the confectionery industry and for process solutions.

Bühler sees great opportunities with bars, with CHF 500 million a year, Countlines has enormous market potential, according to Bischof. “The opportunity to grow is immense.”

**ADDED VALUE**
+ Processes across the entire value chain
+ Comprehensive know-how for chocolate, biscuits, candies and snack bars
+ Competence center for confectionery in Leingarten, Germany
+ Expertise in flavor and nutrition trends

Would you like more information?
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Interview

“Our credo is to transform”

Why Johannes Wick, who heads the Grains & Food business of Bühler, thinks that food safety is so crucial, what insects have to do with sustainable nutrition, and where the Internet of Things is already a reality.

TEXT: BURKHARD BÖNDEL / PHOTOS: RALPH RICHTER

Mr. Wick, you have been the head of Bühler’s Grains & Food business for a year now. How do you position this business, and in what areas do you plan its further development?

Feeding the rapidly growing world population is an immense challenge for all of us. The keywords in this context are malnutrition, obesity, losses in the value chain, and a not-so-sustainable way of handling resources. Over 30 percent of all foods or food crops are still being spoilt. The consequences of improper nutrition, for instance obesity, pose a serious economic problem. At the same time, the digitalization boom has now also caught up with the plant and equipment manufacturing industry.

In this period of accelerated change, we believe our role is that of a solutions provider and partner for the future of our customers. Our credo is to transform today’s urgent challenges into new, sustainable business opportunities for ourselves and our customers. But I also wish to stress that we want to be partners over several generations with a full offering, which is why we also offer single machines and plant services. We even plan to further enhance these services and to make it easier for our customers to order these products, for example through our myBühler online portal.

Could you cite an example to explain your positioning as a solutions provider and partner for the future?

We all know that protein production is no longer consistently sustainable even today. We grow soybeans in gigantic monocultures, and we are overfishing the oceans in order to produce animal feed for meeting our meat consumption needs. Moreover, global population growth is further exacerbating the protein problem. Experts call this the protein gap, which by the year 2050 is projected to widen to over 250 million metric tonnes – if we fail to do anything about it. But we are doing something! By utilizing byproducts and waste obtained in food production, we have rolled out solutions for breeding and processing insects that enable us to develop a new, sustainable protein source on an industrial scale. We have further developed our extrusion process technology to the point of now being able to produce meat substitutes from vegetable proteins that are all but indistinguishable from the original. In doing so, we have designed the processes right from the start to ensure that they will meet the required food and feed safety standards.

How important is this issue to you?

It is absolutely crucial. Without food safety, everything else is jeopardized. Tomorrow’s consumers demand transparency along the entire production value chain, from growing of the raw materials to processing and consumption. The process safety and transparency requirements that food producers are expected to meet have increased enormously. And the risks of product recalls and product liability also have to be taken into account.

At the same time, governments around the globe are tightening regulations. How can I as a miller, baker, biscuit or chocolate producer migrate successfully into this new era of food safety? And how can I also seize this as an opportunity to further improve the efficiency of my production processes? Safety must go hand in hand with productivity and quality. In this area, we offer our customers integral solutions comprising plant and process know-how, engineering, automation, services, and training.

The Bühler Networking Days that you organized last August in Uzwil marked the first time you presented this position… … and we received fantastic feedback. Without
“Without food safety, everything else is jeopardized.”
exaggerating, I may say that the 750 attendees – who taken together ensure that about 4.5 billion people have their food everyday – were enthusiastic. As a process and technology company, we are not only the interface between academia, start-ups, and industry partners but also the food producers.

We took advantage of this position to invite all parties involved in grain processing to Uzwil in order to discuss sustainable solutions together – for instance how we might reduce grain losses along the value chain by ensuring data transparency. The fact that we created such a platform for the Grains & Food industry was highly appreciated. We therefore plan to continue the Networking Days concept and also to design our appearance in a similar way at the Interpack trade show in Düsseldorf in early May.

What are the focal topics during Networking Days 2017 @ Interpack?

Again, they will cover the major issues – nutrition, food safety, Internet of Things (IoT), and sustainability. We will highlight six processes, for example from sugar to candies, from cocoa beans to chocolate, or from grain to bakery products. We will round off this portfolio by presenting our latest automation solutions and services.

So, that means no profusion of equipment as in the past years?

Bühler has changed fundamentally. We still claim to be the creators of the world’s top technologies, production plants, and equipment. And, of course, we will also show that again. But today, we are increasingly embedding these system components in integral and consistent processes. Over the decades, many of our machines have been refined over and over again. The large potential now resides in optimizations of entire processes and the services building upon them. That is our unique selling proposition in the marketplace.

Has this also caused Bühler itself to change?

Yes, it has, and even very much so. In the past, our markets and customers were clearly allocated to our various business units. If we consider processes along all the existing value chains, the boundaries between individual units become blurred and irrelevant. Our internal organizational structures must not be allowed have any significance for our customers and partners. We are one company, we are Bühler. That’s it.

Confectionery is a topic at Interpack. What are the challenges for producers in this area?

In addition to the reduction of the sugar and fat contents, doubtlessly the limited availability of cocoa. Worldwide, just under 5 million metric tons are harvested annually, but this volume can only be increased to a very limited extent even if demand increases as it is doing today. Here, two approaches are important for our customers: the prevention of losses along the process chain and top end product quality. This is precisely our strength. For instance, in order to cut sugar usage, combined biscuit and chocolate products are emerging, in particular in areas such as chocolate-coated bars or cakes. This is an area in which today we can offer our customers the entire range of production processes.

Wouldn’t another point be sustainability in growing cocoa?

No doubt. This poses a challenge for the whole industry. I am convinced that we will find new approaches to improving the situation in African countries on a sustainable basis. Even now, we are building processing systems that are tailored to the specific needs in the growing countries such as Ivory Coast or Cameroon.

You presenting Automation Services in their own right for the first time. Why?

Automation and data services have taken on strategic significance for our customers as a result of digitalization. Take two examples: Feed and food safety demands consistent traceability and documentation of the processes and products involved. When I buy a loaf of bread or a bar of chocolate in a supermarket, I basically want to retrace the entire value chain, starting right from raw materials reception. This is only possible on the basis of automation solutions that cover entire processes and are integrated in other systems such as merchandise planning and control. The second point is that we have developed a retrofit service concept for existing processing plants that ranges from simple maintenance routines all the way to extensive updates including the control and automation systems. In some cases, this enables us to increase the yield by as much as 3 percent, to cut energy consumption by 20 percent, and to improve the quality and ensure the safety of the end products. This, too, is sustainability: to revamp existing installations and to make them fit for the future.

\[\text{“We are investing considerable sums in connecting our data to the Cloud.”}\]
provide us with patterns that we can use for boosting the quality, efficiency, and uptime of plants and for ensuring food safety. For this purpose, we are currently investing considerable sums in connecting our data to the Cloud and are cooperating with Bosch for sensors, and other partners.

**How receptive are your customers to the idea of allowing their data to be fed into the Bühler Cloud?**

As long as no product information such as formulas or recipes are involved, we believe their preparedness is very great. We are therefore making sure that our IoT solutions distinguish strictly between the plant and equipment data on the one hand and such confidential intelligence on the other, so that process data and nothing else is transferred to our Cloud.

We also have the benefit that Cloud solutions are increasingly becoming part of our private and professional everyday lives and that we know how to handle them.

**How long will we still have to wait before the first IoT applications are rolled out?**

They are already here! We have already sold the first IoT services – and they do not include a single piece of hardware. For example, with a kind of subscription service, we validate a customer’s processes online in terms of food safety and document that they are operating their production system in the safe range.
Cultivating a sustainable food industry in Africa

Give a man a loaf of bread and you feed him for a day. Log onto a computer and teach a man how to process maize, and you feed him and a whole community for a lifetime. This philosophy motivates Bühler volunteers to offer their time remotely to Partners in Food Solutions.

TEXT: ISABELLE MITCHELL / PHOTOS: COURTESY OF PARTNERS IN FOOD SOLUTIONS
We live in a world where we can do anything online – from shopping to studying to finding the love of our life. Now, we also have the ability to do good online and literally make the world a better place during a lunch break. Virtual volunteering can be the ideal solution for people who want to make a difference but can’t leave their jobs for extended periods of time: In the 21st century, technology enables volunteers to support causes by contributing their time remotely.

At first glance, sitting at a desk in an office doesn’t seem comparable to getting your hands dirty at a far-off location, but the digital model offers enormous potential for long-term change. “Volunteering remotely is not an isolated activity, but becomes a part of everyday life,” says Eliana Zamprogna Rosenfeld, PFS Board Member and Sustainability Officer at Bühler.

Partners in Food Solutions (PFS) has been working on creating a more sustainable food industry through virtual volunteering since 2011. The Minneapolis-based nonprofit organization links food industry professionals with small and medium-sized food processors in Sub-Saharan Africa via collaborations with corporate partners, including Bühler. After identifying businesses that need technical or administrative assistance, PFS partners them with virtual volunteers who share their skills and knowledge online to address the food processing challenges of the entrepreneurs.

Bühler has partnered with PFS since 2013. In the last four years, our virtual volunteers have worked on 25 projects, and the challenges they have addressed range from food safety to grain processing and business development. Sitting at a desk in your office will never compare to getting your hands dirty on the ground, but the digital model offers enormous potential for long-term change: Volunteering is not an isolated activity but a part of everyday life. “Each of us wants to positively impact the world, and at Bühler, we want to give each employee the opportunity to do it in the most effective way,” explains Zamprogna Rosenfeld. “Working with entrepreneurs from small and medium-sized companies in Africa enables our employees to fully understand the market. They can use the skills and experience they already have and – with only one to two hours of volunteering time per week – really make a difference.”

A win-win situation
The digital setup has many advantages: Partners in Food Solutions can reduce travel and administrative expenses for companies that want to share their expertise and that of their employees, while offering many African entrepreneurs access to the know-how of the world’s leading food processing companies to create a sustainable food industry. Volunteers do not have to take time off to travel but spend a couple of hours each week sharing the knowledge they already have. In return, they can do good and gain valuable soft skills.

The virtual volunteering model is not without challenges. “It’s volunteering without the wow-effect. You don’t travel abroad and this kind of collaboration misses a lot of emotions, which is usually a big part of the volunteering experience,” says Anna Hundhausen, CT Management Trainee and PFS contact at Bühler. “Perhaps joining a Skype call and talking about the topics you know best might feel like just another day at Bühler, but it has an added bonus: You’re changing lives and making the world a better place.”

Volunteer process

1. Volunteer contacts PFS
2. Volunteer registers online
3. Volunteer looks through open positions & chooses a project
4. Project team executes the plan. Volunteers spend about 4-6 hours per month. Projects typically last 4-6 months
5. PFS assembles virtual volunteer team & kicks off project
6. Aligns field staff, clients & volunteers on project objectives
7. Project is completed & field staff oversees implementation of the project. Volunteers, client & field staff have final debrief meeting & close project
In its efforts to make sure every human has access to healthy food, Bühler wants to encourage at least 220 volunteers to sign up with PFS by 2020.

To turn that plan into a reality, a team around Zamprogna Rosenfeld is working on making volunteering a natural part of the employees’ personal and professional development. Through improving the volunteering process, including more feedback and a better matchmaking process for projects and volunteers, the experience will become even more efficient and enjoyable.

An optimistic future
In March, representatives of PFS came to Bühler’s headquarters in Uzwil to discuss upcoming projects and develop strategies to get more even more volunteers on board. One of the most important lessons that Jimmy Bettcher, Director Volunteer Operations & Corporate Engagement at Partners in Food Solutions, brought across was that all Bühler employees can become virtual volunteers. “You might think that you are an expert and can help our clients in Africa, but you’d be positively surprised. Our clients are basic food businesses and the problems that they face are fairly straightforward, yet important,” says Bettcher. “Working for a company like Bühler, you have world-class expertise that is certainly very useful for an entrepreneur in Africa. Don't be afraid and don't worry that you might not have the expertise to help – you definitely do.”

Partners in Food Solutions’ virtual volunteering model is a project that Bühler proudly supports – not just because it allows us to share our expertise in the food processing industry. The collaboration also underscores our mission to give every human access to healthy food. The partnership with PFS and the work of our virtual volunteers further underscores our goal of delivering the technology and solutions both on the ground and online.

About Partners in Food Solutions
Partners in Food Solution (PFS) connects corporate volunteers with entrepreneurs in Africa to cultivate a sustainable food industry. The independent nonprofit organization works with corporate partners, such as Bühler, General Mills, Cargill, Royal DSM, Hershey, and Ardent Mills, and aims to increase food security, improve nutrition, and advance the development of the food processing sector in eight sub-Saharan countries. PFS doesn’t achieve its goal by donating money or distributing seeds, fertilizer, or equipment. The organization makes an impact through virtual volunteering. Through this model, virtual volunteers share their skills and knowledge online with entrepreneurs to help them with food processing challenges.

www.partnersinfoodsolutions.com

PFS empowers entrepreneurs and supports a network of food industry professionals across Africa.
Reducing mycotoxins in food production

Around 25 percent of food crops in the world are contaminated by mycotoxins.

The presence of poisonous chemical compounds, mycotoxins, are a growing concern for humans and animals. Mycotoxins are formed by mold fungi on food and feed crops. Extreme weather conditions, such as drought and rising temperatures resulting from climate change have increased the production of mycotoxins.

Bühler provides integrated solutions for the efficient prevention and reduction of mycotoxin levels in both raw materials and end products. Solutions range from storage concepts to various cleaning solutions along the process line. The focus is on the effective removal of kernels and fragments that carry the fungal contamination. These can be identified by their properties, such as anomalous density, size and certain optical properties. They can then be removed from the product using Bühler cleaning technologies, which include mechanical separation with integrated aspiration and Sortex optical sorting.

The first class of apprentice millers graduated from the African Milling School in Nairobi, Kenya, on November 25, 2016. The 26 graduates from eight African countries reached operational milling excellence during their two-year milling course.

The program offers a professional and intensive training for the next generation of millers and includes both theoretical and practical aspects of grain processing. The graduation event was attended by many people, ranging from proud family members to high-level representatives from the African milling industry and Bühler customers from Africa and the Middle East.

Bühler congratulates the graduates on their outstanding performance and wishes them all the best for their future. The African Milling School is striving to become the know-how center in grain processing for Africa and the Middle East.

Demand for the school’s services is high. The 2017 course began in February with another full class of talented, young trainee millers.

Bosch and Bühler form cooperation

Bosch and Bühler are working together to create sensor solutions for the food industry. The two parties signed the commercial framework for this cooperation and presented an intelligent roller mill at the Bühler Networking Days in August 2016.
Electric cars improve air quality and reduce CO₂ emissions. On the basis of the proven extrusion process technology, Bühler has developed a solution for producing electrode slurries. Slurry quality has a direct impact on the performance of the storage cells. In 2016, Bühler received several orders for plants on an industrial scale for this process solution.

The countlines market is growing rapidly in both emerging and established confectionery markets. With the countlines portfolio of Bühler Leingarten, we are able to address a new market worth CHF 500 million. In addition to the chocolate market, Bühler is now able to offer complete lines for biscuits and cookies and also for complete cereal and snack bar production as cross business unit solutions. It also offers process solutions for the production of nearly all kinds of cookies, caramels, and candies.

In November 2016, the Bühler business unit Oil was awarded with the supply of its biggest order in recent oil processing history. City Group, one of the largest industrial companies in Bangladesh, entrusted Bühler with supplying equipment for a new soybean warm-dehulling plant with a capacity of 5,000 metric tons a day.

The order includes complete preparation equipment for soybean cleaning, conditioning, hulling, debittering, meal, and hull grinding as well as bagging and truck loading.

Bühler was also awarded the engineering and the complete automation of the oil mill, eventually making it the most comprehensive reference plant for Bühler in oil processing in the global marketplace.

Bühler opened a new plant for the production of rice processing machines in September 2016. With these new solutions, local rice processors can now offer their products at a quality that meets export standards. Around 5,000 rice processing plants produce over 45 million metric tons of rice per year in Vietnam.

About 10,000 of the 120,000 rice varieties are currently cultivated.
Bich Tuyen and Luong Trung Hieu are united in their vision of leading their country into a better future – with rice. Bich Tuyen, a spirited businesswoman and owner of Phung Hoang Rice Mills, and Luong Trung Hieu, General Manager of Bühler Farmila Vietnam Ltd., have partnered to align the rice solutions offered by Bühler with the needs of the local market.

“I want Vietnam to produce the best rice in the world.”

Bich Tuyen, owner of Phung Hoang Rice Mills
Luong Trung Hieu and Bich Tuyen share the same vision for Vietnam’s rice.
Things must happen very quickly now. It’s the end of 2014, and Tết, the Vietnamese New Year’s Festival, is just around the corner. Bich Tuyen urges her workers to speed up. Just a few days ago, the 37-year-old made a quick decision: She wanted to double capacity to 400 metric tons a day. To achieve this, she ordered new optical sorters, automatic bagging machines, and 30 new 100-ton storage bins from Bühler.

Half the factory has to be dismantled and installed again to accommodate the expansion. The clock is ticking. In less than three months, the plant is scheduled to be up and running at full capacity again. Why the urgency? Tết is more than just a religious festival; it also marks a change in time in the business world. During three long days, so the custom says, everything must be shut down; after that, business restarts with gusto. “The best business is done just after Tết. If we fail to start up the plant by then, we will lag behind during the whole business year,” says Bich Tuyen.

That’s one thing she doesn’t want to risk, come what may. For three years now, she has partnered with Bühler on the fast lane, modernizing and expanding her rice business at turbo-charged speed. With the new plant and the higher processing capacity, she plans at last to enter the export business on a big scale. She feels that her chance is coming, and 2016 will be her first breakthrough. This drive, this determination, this will to be successful: This is Bich Tuyen.

From the Mekong Delta, she is the product of her home, of its landscape, climate, and culture. In her case, this means the endless terraced fields, the never-ending rich green colors, heat, fertile fields – and: rice. Rice everywhere. The region is the largest area in which this staple food is grown in Vietnam; it’s the southern breadbasket of the country with 25 million tons harvested here every year. More than 1.6 million rice farmers cultivate Vietnam’s fields, 70 percent of the country’s population work in agriculture. This is where Bich Tuyen grew up. Rice creates jobs. Rice creates
life. And, rice was to become her life. Bich Tuyen's family, who live in the village of An Giang near the Cambodian border, operate a small-scale rice mill of the traditional type. “I grew up with rice,” she says. As she grew older, she gradually became a part of the family business, which she joined in 2005. The more she immersed herself in this discipline, the more the certainty she felt that this was her vocation: “I want Vietnam to produce the best rice in the world.” This is her vision. Vietnam today ranks third among the world’s rice exporters, just behind Thailand. But the image of the produce exported is not what it should be, mainly because of outdated technology which doesn’t take food safety needs into account and doesn’t allow rice producers to control their mills to achieve the highest efficiency and the best and consistent rice quality.

**A quality brand for Vietnam**

Bich Tuyen is painfully aware of this all and she is determined to break the cycle. The opportunity she always waited for presented itself two years into business. She decided on August 28, 2007, to set up her Phung Hoang company with the aim of building a quality brand for Vietnam and Southeast Asia. A brand that not only stands for top products, but also for ecological and social sustainability. “What is important to me is to ensure that we harmonize our business success with social needs and that we make a positive contribution to the development of our society,” says Bich Tuyen. As she sees it, rice is not only business, rice means life. And she wants a good life, not just for herself, but for her employees.

In this, she is not alone. She has fellow fighters. One of them is Luong Trung Hieu, 40. He, too, is dreaming of leading his country into a better future with rice. “Prime rice quality is not possible without prime rice processing technology,” he says. That is precisely what he intends to develop and build. After graduating in mechanical engineering from Ho Chi Minh City University of Technology he too entered the rice business. He familiarized himself with the import and
“Prime rice quality is not possible without prime rice processing technology.”

Luong Trung Hieu, General Manager Bühler Farmila Vietnam, Ltd.

export business, installing rice mills in Indonesia, the Philippines, and Cambodia. In 2009, he joined forces with a few colleagues to set up Farmila Vietnam Ltd., which he incorporated in 2013 in a joint venture with Bühler. The partners plan to align the rice solutions offered by Bühler with local market needs.

It was only a matter of time before Bich Tuyen and Luong Trung Hieu met. It happened in 2013. “We noticed from the start that we share the same vision,” they say in unison. In Luong Trung Hieu, the rice lady finds her technical alter ego. And with the whole global Bühler organization backing him, Luong Trung Hieu can offer her something that no one else in the market can: a top-level integral solution ranging from reception and handling of the still moist, unhulled, and often dirty paddy rice, to cleaning, drying, hulling, polishing, sorting, and packing. Bühler is serious about customer proximity: In January 2013, the Group opened its own location for rice technology and processing solutions in Vietnam.

It’s much harder to process rice than it is to process corn or wheat, requiring regional roots that match the existing regional peculiarities. Whereas all the other grain varieties are similar in the way they are grown, harvested, and ground into flour, the cultivation of rice has myriad facets. In particular, the rice kernel is not allowed to break despite the tough and efficient mechanical process it undergoes. Broken rice is of inferior quality and around 35 percent less valuable. Bühler’s gentle processes and equipment generate up to 5 percent less broken kernels. That’s pure money, and it does not take long to convince Tuyen. She ordered the first hullers in 2013. Tuyen enthuses: “From the very first day of our collaboration, Bühler always delivered what they had promised.” If issues cropped up in the projects, the partners spoke openly to clear away the problems. “We are honest in dealing with each other,” says Luong Trung Hieu.

Thus, the hullers paved the way for the first large-scale project: a completely new rice reprocessing system equipped with state-of-the-art process technolo-
gies and machinery. It all began in April 2014. Then, in record time, the partners set up the most advanced plant in Vietnam with an input capacity of 500 tons per day, 20 percent better energy efficiency, maximum uptime, and top automation. Bich Tuyen then began thinking bigger, making an order for another new rice mill plant again using the complete solutions from Bühler – this time with an input capacity of 400 tons per day.

The six Sortex S sorting lines stand out in this facility. Each and every single rice kernel is optically assessed in the process, and the discolored or damaged ones are removed. The Sortex S is the most advanced optical sorter in the marketplace. The machine scans 20 million kernels a minute with 250 data points and an outstanding hit rate. “This has enabled us to reach a quality level unknown up to now in Vietnam,” explains Bich Tuyen. As contaminated kernels are systematically removed from the food chain, Phung Hoang can now guarantee a top food safety standard – a first in the Vietnamese market.

**Performing under pressure**

It’s early February 2016, and the pressure is on to move fast as Tết, the New Year’s festival, is swiftly approaching. “Right from the beginning, we were aware of the fact that we were facing a ‘mission impossible’,” remembers Luong Trung Hieu. But he, too, shows determination and makes an unusual decision: Every able-bodied individual in the office able to carry, bolt, cut, weld, and join things, is called on to lend a hand over the next few days at the construction site. Sales staff, designers, engineers, research and development people, and accountants worked together with the construction site specialists. “That impressed us tremendously,” she says.

The partners accomplish what seemed impossible: Before Tân Niên, the first day of Tết, all the work was completed. Just after the New Year’s festival, Bich Tuyen goes into the export offensive, delivering 1,000 tons of top-quality rice to Dubai. With its high quality, food safety, and production efficiency, Phung Hoang has gained a leading market position in Vietnam. Inspired by this success, Bich Tuyen is planning to increase the plant’s capacity by a factor of five! “Our joint journey has just started,” smiles Bich Tuyen.
Ueli Jordi, Process Consultant Bühler, and Alfredo Dávila, Head of Processes at Bacar.
Alfredo Dávila and Ueli Jordi have been working together to increase the competitiveness of Bocar in the automotive industry. As a Tier 1 supplier, the company must respond quickly and flexibly to ever new requirements. Innovative solutions and comprehensive training from Bühler help Bocar survive and thrive in this fiercely competitive market.

“*We can’t afford to make mistakes. Trust is important. Trust in Bühler and in Ueli.*”

Alfredo Dávila, Head of Processes at Bocar
Alfredo Dávila, Head of Processes at Bocar, smiles at his neighbor. "We did well. Number 140 is ready," he says. He is standing with his team in the giant Bocar factory hall, located at the gates of Saltillo in the Mexican state of Coahuila. At its highest point, the hall reaches 20 meters. Dávila places his hands on his hips, stretches, and regards the most recent addition to his machinery with appreciation: a Bühler die-casting machine from the Carat 220 series. The Carat is a stoic giant. It is 130 tonnes heavy, 13 meters wide, 5 meters tall, and has a clamping force of 2,200 tonnes. Even under the harshest conditions it operates safely and reliably. Stairs lead to the heart of the machine: the closing unit, which will create body parts for a leading automobile manufacturer by the minute.

A specially constructed vehicle transports the liquid aluminum and pours it into the ladling furnace. The vehicle seems tiny next to the die-casting titan. The raw material flows from the tilted transport vessel and briefly transforms the production hall in a place of metamorphosis, where liquid raw material is transfigured into any shape. The machine now closes and the melt is cast under high pressure with a loud bang in a die-cast mold within 50 milliseconds. As the melt solidifies inside, the machine seems to pause. Dávila holds his breath. Time stands still. Finally, the closing unit opens and an industrial robot removes the newly created body part. A second robotic arm subsequently cleans the mold. The sprayed water evaporates in a hissing cloud of steam. But that is not all. The next cycle is lined up and the customer is in a rush. His production lines must never stop.

Ueli Jordi, Process Consultant at Bühler, stands beside Dávila. He calmly watches the process. His decades of experience in die casting give him assurance and certainty of being able to solve any problem, together with his partner and friend Alfredo Dávila. Under their guidance, the new Carat die-casting machine was delivered to Mexico and installed. It is, however, by no means the first delivery. Bocar has relied exclusively on die-casting machines from Bühler since 1958. And yet each delivery holds new challenges: the first, second, tenth, and this one as well, the 140th machine that Bühler has supplied to Bocar over nearly 60 years. Dávila looks at Jordi. "Let's celebrate," he says. "We can be proud. The team did an outstanding job. We deserve a feast."

In 1958, Bühler delivered the first die-casting machine to Bocar, then still a small company in Mexico City founded by German immigrant Federico Baur. "A lot has happened since 1958," says Dávila. Bocar, the name made up of "Bombas" and "Carburadores" – pumps and carburetors – is now one of the leading suppliers in the automotive industry in Mexico. The company supplies popular car brands around the world. Based on an idea, the founder created a company that now features 6,000 employees, 10 production sites throughout Mexico and development offices at the centers of the automotive industry: Detroit, Wolfsburg, and Yokohama.

Long-term relationships and stability form the company's DNA, which is still owned by the Baur family. These values are essential to Bocar, and the company asks their suppliers also to adhere to them. “With the extremely high competitive pressure in the automotive industry, it is decisive to have strong relationships with partners. And one partnership in particular stands out: Bühler,” says Dávila. “The pressure in the industry is high. We can’t afford to make any mistakes. Trust is very important. Trust in Bühler and in Ueli.” Jordi nods. He knows the conditions in the automotive industry all too well and values the trust of his long-standing partner.

**Unique partnership since 1958**

Ueli Jordi has worked for over 35 years in the die-casting industry, and since 2000, more and more for his customer Bocar. The former head of training at Bühler first started with conducting customer trainings at the Mexican company. Bocar management was well aware that he could help the company improve its processes and increase productivity. As a result, Marcus Baur, the founder's son and today's President, one day handed Jordi a list of 11 problems. “Can you help us?” he asked.

Shortly thereafter, Jordi took over the key account management for Bocar. At this time, Mexico had long since...
become an industrial nation. With the North American Free Trade Agreement (NAFTA), the country has access to the largest free-trade area in the world. Meanwhile, Mexico’s economy occupies the 14th place worldwide.

Step by step, many international companies set up manufacturing sites in Mexico. GM, Ford, Chrysler, Volkswagen, Honda, Toyota, Nissan, and many more, all relying on “hecho en México”. Along with the new manufacturers, the demands on the suppliers grew. This played into the hands of Bocar, as the company had always – with Bühler machines – focused on the highest quality in order to meet or exceed the tolerance limits of the original manufacturers. “With new customers, international standards, and economic growth in Mexico, our situation changed significantly,” explains Dávila. “In terms of costs, we are competing with suppliers from Asia, particularly from China. With regards to quality and delivery reliability, our customers demand the highest standards and strictly penalize any deviation from the original drawings. In order to keep our employees, we must also be a superior employer.”

Some 50 years after the company’s founding, it became clear that Bocar had to fundamentally revise its processes, in order to be successful in the market in the long term. In close consultation, Dávila and Jordi worked out a set of measures: The objective was to sustainably increase the efficiency and thereby the productivity of the Bocar plants. At the same time, the high demands on quality and delivery reliability were to be met. It was clear to both that they needed to build a strong and well-trained team. “Technically, we were already up to date,” explains Jordi. “But with regards
to the processes and collaboration in the factories, there was still much to do. We needed to change our way of thinking.” Dávila is convinced Jordi’s education and training experience was decisive for their success. “The training is intensive and takes several weeks, spread throughout one full year. We wanted to enhance the profile of the machine operators, thus giving support and recognition to those who ensure that the die-casting machines function properly every day. We also do not call them operators anymore, rather cell technicians in order to give the change a name,” explains Dávila.

With these measures, Bocar achieved change. Productivity increased by 15 percent over three years, which is equivalent to about two hours more operating time per machine. The changes had also an impact on staff: Satisfaction increased with the cell technicians, and they stayed longer with the company. Through initial success and fruitful cooperation with the team in Mexico, Jordi increasingly focused on his work at Bocar. “In the beginning, I visited Alfredo’s team in Mexico perhaps four times a year. By 2016, this had turned into nine visits, usually for two weeks. Our cooperation became continually closer. I’m slowly becoming part of Bocar,” says the longtime Bühler employee. Since the beginning of the year, he has been 100 percent responsible for the company after handing over all other mandates.

Performing under pressure
Jordi is well-known in Saltillo as well as at the other sites and is warmly greeted by all sides. The staff at Bocar appreciate his experience and his persistency in addressing issues. Even when he is not in Mexico, his internal clock runs in accordance with this country.

“My day starts a little later, but because of the time difference, it also lasts significantly longer. When I am in Switzerland, I maintain contact by teleconferencing daily with my partners, mainly Alfredo,” says Jordi. “For new developments, I am close to the action and can incorporate the latest innovations from Bühler. We have been using 3D printing, for example, for very complex die-casting molds for nearly a decade.” Teams are now working to reduce the amount of cooling water from the current use of up to five liters per cycle to just a few milliliters. This will save considerably more than 1,000 liters per machine per day and is so economically and ecologically sensible that Jordi didn’t need much to convince his partner to take on the necessary development costs. Dávila, Jordi, and the core team at Bocar Saltillo celebrate the successful commissioning of the new Carat as is customary for a Mexican family: with a barbecue outdoors. This marks the completion of a successful project.

No one questions whether and how things will continue because the new machine hall in Saltillo has only been filled halfway so far. The plans for further develop are underway. Upcoming die-casting machines from Bühler have already been ordered. Jordi and Dávila raise their glasses and toast one another. To the next project. To number 141. To a continued successful cooperation as partners.
“We needed to change our way of thinking in regard to processes and collaboration.”

Ueli Jordi, Process Consultant at Bühler

The Bocar Group has around 6,000 employees and primarily serves the automotive industry. Key products include high-quality precision parts and complex assemblies made of plastic and aluminum for automotive applications. The Group has 10 production sites in Mexico and development offices in Germany, Japan, and the US.

Alfredo Dávila initiated an education and training for his employees to increase productivity at Bocar.
Contributing to a better world

Wilhelm Baum has worked in the automotive industry for over 35 years. In his capacity as CEO, the engineer by training heads the Bocar Group in Mexico, an important vendor to the United States automotive industry. He views the political changes in the US with a critical eye. And his advice to young engineers is: first complete an apprenticeship!

TEXT: SAMUEL ECKSTEIN / PHOTO: BOCAR

Bocar just recently started up its 140th Bühler die-casting machine. How would you describe the cooperation between the two companies?

Bühler is a dependable partner. Our long-standing and close personal relationship with Bühler ensures a continuous inflow of top-notch technology into our organization. Together, we have been seeking innovative solutions for years. And our successes are evident: We have achieved improvements in the quality of our products and in the reliability of our processes. This enables us to better cope with the intense competition that prevails in the automotive industry.

What does Bocar stand for?

The only continuity for us is change and our ability to adjust to new situations. Sounds a bit commonplace, I know, but that’s the way it is: This is the natural consequence of the dynamism existing in the automotive industry. And to be honest: This is also what makes it so fascinating. We are holding our own in this environment by adhering to the values of discipline, order, and cleanliness. To retain good people in this dynamic environment, we are setting our focus on people. We accept our social responsibility.

Are you feeling the effects of the political changes in the US?

Of course we are. After all, Bocar exports about 80 percent of its products to the US. In view of the changes that have taken place, some companies have already scaled back or even entirely stopped planned investments and are increasingly focusing on the US as a location. Like many other companies that export their goods from Mexico to the US, we too are worried about the changes that are taking place and what the present government is doing.

This shows us clearly how very important it is for a country to be led by responsible, level-headed, and forward-looking politicians. This is also true when it comes to global environmental protection.

Environmental protection is a good keyword. According to the Bühler 2016 Annual Report, you are – for instance – working on trimming the cooling water consumption of your production systems. How important is sustainability for Bocar?

Cutting water consumption is an essential element in our sustainability strategy. Water is a precious good. Protecting and preserving it is extremely important to us. I myself am personally seeing to it that this is done. In addition to water consumption reduction, we are also committed to energy efficiency. Our plant and equipment consumes a lot of energy, which we plan to increasingly draw from sustainable sources.

You grew up in Germany and are now living in Mexico as the CEO of the Bocar Group. How did your career lead you to Mexico?

The automotive industry is a global business. I grew up in Bavaria, where I underwent my first training to become a toolmaker and engineer. But my career is just as global as the automotive industry itself: I have worked in Germany, Italy,
and the US and now head a fascinating company in Mexico with Bocar.

**What is it that fascinates you personally?**
I developed an enthusiasm for engineering and a passion for cars at a very early age. I have also always been driven by a quest for new solutions and improvements. As the father of two grown daughters, family life has also always played an important role in my life. I am glad that my wife and I feel at ease in our new surroundings in Mexico. We became integrated here within a short time.

**What would you advise young engineers to do today?**
Today, of course, young people all want to go to university as quickly as possible. But my advice would be: first complete an apprenticeship. Solid, hands-on training as a young person is a once-in-a-lifetime opportunity and provides the foundations for acquiring extensive knowledge and achieving professional success. The dual education system as we know it in Germany and in Switzerland is unique and will always pay off. Young people still have the chance later on to study at university, and needless to say that also international experience and uninterrupted continuing education are crucial in our fast-paced world.

**You said it: The world is changing at a breathtaking pace. What trends do you see for the automotive business?**
Mary Barra, the CEO of General Motors, put it to the point: “In the next 10 years, we are going to see more changes than in the past 50 years combined.” This requires enormous flexibility of the vendors to the automotive industry. I believe that important trends are fuel consumption reductions, weight savings on the basis of lightweight structural parts, the increasing electrification of vehicles, and then of course also autonomous driving.

At the end of the day, the main point is that we slash the burden on the environment, the consumption of resources, and the health-impairing risks of automobility. These issues are very important also to me personally. I am the grandfather of three grandchildren between ages two and three. I would like to be able to tell them – say in 15 years’ time – that I made my personal contribution during my lifetime to making the world a better place.

“Together, we have been seeking innovative solutions for years. And our successes are evident.”
Macro benefits of micro grinding

A new Bühler predispersion system now enables the benefits of micro-grinding media to be utilized for straightforward dispersion applications such as printing inks production.

Printing inks or protective paints are produced by a wet-grinding process using bead mills. These systems, for example, reduce paint pigments by exposing them to the continuous action of countless tiny beads and dispersing them throughout a vehicle or carrier liquid. Bühler MicroMedia process technology is often found to be the optimal approach to engineering applications such as the manufacture of color filters for liquid crystal displays. “These systems use grinding media that are no larger than a few micrometers and allow dispersions to be produced down to the nanometer range,” explains Norbert Kern, Head of Product Management at Bühler Grinding & Dispersion Technologies. Other benefits include energy consumption reduction by as much as 50 percent and roughly 30 percent higher productivity of the grinding system.

But because the quality requirements have also increased in standard dispersion applications, producers of printing inks or functional coatings are increasingly looking to use micro-grinding media of minute dimensions. They also believe that such media offer them economic advantages: As the pigments are micromilled to a much finer extent, such manufacturers need less coloring agents and can achieve a higher profit margin.

Pretreatment is the key

In order to fully utilize the benefits offered by the MicroMedia process technology, it is important to optimally pretreat the material before processing. Often, the actual wet-grinding process is preceded by no more than a simple mixing process. However, if mixing is not absolutely homogeneous, this may later on give rise to problems in the grinding process. “If the particle size distribution is not sufficiently uniform, this will clog the mill or make it necessary to operate it with larger grinding media,” says Kern. Another drawback is the creation of deposits, which calls for frequent cleaning intervals and thus downtimes.

Bühler has seized this opportunity to optimize the wet-grinding process as a whole by adding a new predispersion solution. The result is MacroMedia: This compact system comprises all the important components such as pumps, material handing system, and dispersion zone and can be integrated with great ease in existing production environments.

Particular attention has been paid to high process reliability and ease of cleaning. The dynamic self-cleaning, multiple gap separation system prevents product particles from settling in the dispersion zone.

High reliability and reduced energy use

Moreover, the system’s excellent penetration rate enables high recirculation rates to be achieved. “Because this forces the entire contents of the mixing tank to pass through the pack of beads several times, a very narrow particle size distribution is achieved,” explains Kern. Another advantage is the reduced energy consumption: In comparison to a conventional batch mixing system, the new process consumes as much as 40 percent less energy. At the same time, the smaller number of peripheral devices and the lower total installed power requirement additionally cut the energy and installation costs. “First experiences in operating the new system have shown that production processes in market segments such as printing ink manufacture can be decisively improved.”

ADDDED VALUE

+ Optimization of the entire wet-grinding process
+ High recirculation rates and low energy consumption
+ Easy integration in existing environments

Would you like more information?

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An insatiable appetite for meat exists around the globe. As the global population continues to grow, and as the standard of living in emerging countries continues to rise, also meat consumption is projected to increase by about 70 percent by the year 2050. But the production of animal protein for our favorite schnitzels, steaks, or sausages is devouring massive amounts of land and water resources.

Two-thirds of all vegetable proteins produced every year end up in the stomachs of livestock such as cattle, pigs, or chickens – as well as fish. In order to ensure sustainable supplies of high-quality protein, humankind has no other option today than to increasingly utilize vegetable proteins for the foods it consumes.

Meat alternatives are gaining ground
In Europe and North America in particular, more and more people are cutting back on their meat intake and starting to include different meat substitutes in their meals: “Beside tofu, seitan, and mushroom-based products, texturized vegetable proteins (TVP) are becoming increasingly important,” says Carsten Petry, Global Product Manager Nutrition at Bühler. These so-called textrudates are obtained from vegetable raw materials using the cooking extrusion process. Their fiber structure comes amazingly close to that of genuine muscle meat, and when it comes to texture, mouth feel, taste, and color, there’s little to tell them apart.

Dry textrudates have already become established in the marketplace. After production they are dried, and they have a long shelf life. One application that is becoming increasingly popular is wet textrudates. “In this process, the extrudate is cooled as it leaves the die, which imparts even greater strength to the fibers,” says Petry.

Because of their high moisture content of 60 percent, wet textrudates must undergo further processing just like fresh meat. That makes them an interesting addition to the product portfolios especially of companies which are already involved in meat processing and therefore have the appropriate logistics in place.

Processing a wide range of raw materials
Bühler is the leading provider of production solutions for making dry or wet textrudates at high output rates. “All the production parameters can be flexibly adjusted and controlled, which means that one system is capable of processing a whole range of raw materials,” says Petry. At present, soya is the predominant raw material for producing textrudates. This oilseed is not only high in protein, low in cost, and available worldwide. It also allows meat substitutes to be made which have an optimum texture.

Bühler is also researching alternative raw materials. In a study recently conducted in collaboration with the Swiss Federal Institute of Technology (ETH) in Zürich, a number of different vegetable raw materials were analyzed and compared with soya with regard to parameters such as protein content, mouth feel, taste, and color.

Textrudates based on bean isolate, wheat gluten, or sunflower seeds produced particularly promising results. Petry concludes that Bühler will continue to invest in these research efforts in order to enable its customers to produce attractive TVP products on the basis of alternative proteins so as to tap the growing market potential for their business.
Wrapped food stays safe longer – that seems simple; however, the technology behind food packaging is increasingly sophisticated. Bühler’s Leybold Optics PAK and PAK T series supports the food packaging industry in meeting growing food safety challenges and requirements by providing cost-efficient, state-of-the-art solutions.

Whether it’s a piece of fresh meat or a chocolate bar, packaging is needed to protect products, to give them a longer shelf life and to help them stand out from the competition in order to appeal to consumers. Packaged-food sales are on the rise worldwide, spurred by a burgeoning middle class in emerging markets, according to Euromonitor, which projects packaged-food sales to reach USD 2.6 trillion in 2019, up from USD 2.3 trillion in 2015.

Through its business area Leybold Optics, Bühler makes packaging equipment at the forefront of technology. The solutions it provides are robust, safe, reliable, and – crucially – lower in cost. The technology behind Bühler Leybold Optics machines, known as vacuum deposition, involves applying a thin coating on film. Together they act as a barrier against gases, moisture, odors, and microorganisms. The process not only increases food preservation, it also contributes to energy efficiency and provides convenience for the consumer. There are many advantages, but equally many challenges to this packaging process when it is carried out at an industrial scale.

The packaging itself must be lightweight, flexible, strong, and temperature-resistant – in some cases also microwavable.

There are many materials used by the food packaging industry, such as the polymer film BOPP or the polypropylene PET, used for candy bars and a wide range of food products. Therefore the machines that apply aluminum or aluminum oxide layers onto flexible plastic substrates must meet individual requirements. They must also be sturdy with minimal downtimes, fast without compromising on quality, and produce minimal waste. Given that margins in the food packaging industry are low, the solution also needs to be cost-efficient.

A revolution in barrier coating
Bühler Leybold Optics offers a range of machines to meet these challenges. The Leybold Optics PAK series provides aluminum-barrier packaging applications for all common plastic film and paper substrates. The roll-to-roll metallizing system produces a barrier that not only protects the foodstuff, but...
also stands out visually. The Leybold Optics PAK T series is the newest addition and brings with it a revolution in transparent barrier coating.

Consumers increasingly want to be able to see the food inside the wrapping, but transparent barrier packaging has, until now, been too costly to be used in all but high-end goods. This innovative machine design and process concept brings down costs, making it possible to extend the range of food products this process can be applied to. The PAK T is also flexible enough to be used for coating widths from 1,700 to 3,700 mm.

**Contributing to food safety**

“One focus of ours has been on improving the metallization process step, as this results in a better quality of flexible packaging films,” says Antonio Requena, Head of Business Unit Leybold Optics. “In order to coat a thin, flexible polymer, you have to understand its surface structure, then you can improve layer adhesion and barrier properties – both of which are highly important. Bühler’s design for pre-treating the standard packaging films available on the market results in a huge leap in performance.”

Another key to the quality of the packaging is the homogeneity of the layers. Bühler Leybold Optics machines use an innovative evaporator technology that achieves unparalleled homogeneity as well as a striking visual appearance.

“The Leybold Optics PAK series is a rugged, high capacity line for tough, mass production environments that require high-performance packaging material,” says Requena. “Our staff represent hundreds of man-years of experience in the development, design, installation, and servicing of web-coating plants, and they are therefore fully prepared to help our customers meet the growing food safety challenges.”

**ADDED VALUE**

- Unrivaled layer homogeneity and reproducibility
- Easily adaptable to individual requirements
- Cost-efficient solution with minimal downtimes
- Extended product shelf life

*Would you like more information?*

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PolyFlake

PolyFlake, the flaking mill for breakfast cereals, offers significantly higher standards of hygiene. Automatic roll gap adjustment permits the manufacturing of flakes with consistent quality even at the highest throughput rates.

- Modern design allows fast access for cleaning
- A complete roll change can be done in under 5 hours

JetMix

JetMix offers a novel method for the uniform hydration of flour. Various nozzles ensure each flour particle is uniformly moistened, which reduces kneading time by 30%. Within seconds, a homogeneous pre-dough is created. This pre-dough has many benefits, including increased bread volume of up to 20%.

- Automatically cleaned at the push of a button

Azurit and Azurit Plus

The plansifters Azurit and Azurit Plus combine a very high throughput rate with excellent sifting efficiency. They are designed for rebolting right after milling or before bagging. They can also be used for grading powdered, flour-type or granulated products. Both the Azurit and Azurit Plus have a small footprint, therefore the space to performance ratio is excellent.

- Control sifting with up to 20 tons per hour

Tubex

The Tubex hopper scale not only weighs accurately and reliably, it also reduces energy costs thanks to an innovative drive and control system. Customers benefit from having maximum food safety, easy operation, and its minimal maintenance requirements.

95% less energy costs
**Seginus**

Small plansifter Seginus sifts and sorts grist and flour-type products in wheat, rye, corn, and durum wheat mills. In addition, coarsely ground product or free-flowing granulate can be reliably graded. It is possible to flexibly integrate the small plansifter Seginus into the grinding process or as a control sifter.

- 20% more throughput performance
- Up to 70% less footprint

**Diorit**

Diorit, the four- and eight-roller mill, consistently and safely grinds wheat, corn, rye, barley, spelt, and other grains. Maximum sanitation is guaranteed through the use of stainless steel and other food-safe materials. The sturdy, cast-iron machine frame provides an optimal base for high grinding performance in 24-hour continuous operation. Its modern sensor technology ensures that the rolls are always ideally positioned and running at optimal speed.

**Combistoner**

Combistoner combines two separate machines – the destoner and the concentrator. It was developed for high-performance destoning for various grain types such as wheat, corn, rice, rye, oat, and barley. It is optionally available with Air Circulation Separator, which reduces the energy consumption by up to 30% compared to the fresh air system.

- output up to 28 tons per hour

**myBühler**

myBühler, our online customer portal, presents an overview of your Bühler equipment, including documents such as user manuals and spare parts catalogs. It enables customers to purchase spare and wear parts 24/7 or get insights into live pricing and quotations. In addition, the myBühler customer portal allows customers to identify parts easily with a 360-degree view.
Self-Optimizing Smart Chocolate Factory

Smart Chocolate Factory is the self-optimizing digital service for DoMiReCo (dosing, mixing, rolling, conching) lines. With this innovation, Bühler is leading the way into Industry 4.0. Four new game changing services are included in this digital factory. It will increase performance and reduce operational costs. The quality, performance, and availability of your line becomes visible anytime, anywhere.

• 10% reduction in operation costs
• 10% increase in performance

ChocoBotic

ChocoBotic is Bühler’s first small batch moulding line with a throughput of 80 kilograms per hour. The multifunctional robot replaces chains which results in a unique hygienic design.

• Ideal for production processes with limited space
• Reduced cleaning time
• Ideal for the creation of new products

Sortex E Biovision

Sortex E Biovision removes foreign bodies such as shell, stones, and pieces of plastic, playing the most crucial role in the processing line. It removes hazardous material up to 50 percent smaller than previously possible from almonds, pistachios, pecans, walnuts, and hazelnuts, regardless of the tree nut variety. It does this in a single sort, minimising associated losses of good nuts. Processors can accurately remove even smaller fragments of shell and foreign material then currently possible with existing technologies with up to double the capacity of other sorters currently on the market, using the same footprint.

• More than 99% removal of shells

Prime Masa

Prime Masa is Bühler’s innovation for nixtamal corn flour. Using steam instead of water in Prime Masa results in considerable savings, and it preserves the characteristic and unmistakable taste of traditional tortillas and tortilla chips.

• 90% less water
• 27% less energy
**TotalSense**

TotalSense mobile rice analyzer is a cloud-based quality analysis and traceability reporting tool that uses an app to objectively analyze the amount of color defects and broken rice in a given batch. It uses an automated impartial method to consistently provide accurate data. Designed to integrate into the quality procedure.

- Less than 5 minutes for one analysis
- “Brokens” and color analysis in one go
- Proof of quality thanks to grain image list

**Ceres**

Ceres is a state-of-the-art dryer designed for the clean and safe production of coated ready-to-eat (RTE) cereal products. Improved performance, energy efficiency, and maximized production are the results of a game-changing design brought about by an active collaboration with cereal processors from around the world.

- Hygienic design

**Solano**

Solano combines the proven two-step premium-roasting process with a safe steam pasteurization option, which can be used for granular products such as nuts, oilseeds, or cocoa. The patented pasteurization technology achieves a better than 5log inactivation of pathogenic micro-organisms such as salmonella. The pasteurization technology can be used independently of the roasting process so that gentle pasteurization without roasting for raw nuts or oilseeds is easy to apply.

- Up to 3x longer shelf life for roasted nuts

**rollDetect**

rollDetect is an innovative instrument that measures the wear of corrugated (fluted) rolls in grain mills. The software that comes with it enables the wear condition to be objectively evaluated and the optimal point of time for a roll change to be determined. Following a six-month period of pilot operation in the United States, with highly positive customer feedback, Bühler now additionally offers the ecoReport. On the basis of measurements and customer-specific data, this software finds the economically optimal point of time for roll reconditioning. Red Tegeler, Vice President of Operations at Siemer Milling, USA: “rollDetect and ecoReport are revolutionary technology applications for the entire grain milling industry. They allow us to continuously monitor our roll wear in terms of product quality and output. Our mills achieve a higher yield today although we change rolls less frequently.”

- Energy savings of up to 30%
- Higher yield
- Fewer roll changes
The more prosperous people become, the more meat they eat. The environmental effects of this global trend are profound. How can we meet growing demand for high-grade protein while lowering the ecological footprint? The answer lies with insects.

TEXT: MICHÈLE BODMER / INFOGRAPHIC: DANIEL RÖTTELE

Insects have many benefits – they are rich in protein, they don’t need much space to grow, they feed on food waste and, for many animals, they are a preferred food source. They are also excellent recyclers, able to extract up to 70 percent of nutrients from organic waste, and they can be produced almost anywhere, as they don’t need fertile land to breed. These are some of the reasons why it makes sense to rear and process insects for animal feed, along with the fact that they can help us to sustainably address the world’s growing protein gap.

Bühler Insect Technology Solutions was founded in early 2017 to capitalize on these benefits. In a joint venture with Protix, a leading insect production company based in the Netherlands, Bühler Insect Technology Solutions will develop scalable, industrial solutions for the rearing and processing of insects to provide protein sources for the feed industry. The market for insect processing solutions has huge potential: By 2050, insects could account for 15 percent of global protein production. The goal of Bühler Insect Technology Solutions is to develop industrial scale solutions for feedstock processing, larvae rearing and larvae processing, and to produce high-quality insect ingredients – covering the whole value chain from rearing to separation and extraction of proteins and lipids.

Getting all the ducks in a row
The joint venture with Protix is the culmination of many years of work. Bühler started looking at opportunities to utilize protein from insects for animal feed as early as 2009, and installed a pilot facility in China in 2016 to process fly larvae and mealworms. “Over this period, we've invested a lot into really understanding the food safety issues, the conversion rates, and which type of insects it makes sense to work with and which are suited to which animals,” explains Ian Roberts, Bühler’s Chief Technology Officer.

Another step was taken in 2015 when Bühler co-funded a professorship at Zurich’s ETH. Alexander Mathys is an Assistant Professor in the ETH’s Sus-
Protein production: animals vs. insects

Over 9 billion people are expected to live on our planet by 2050. To feed them all in a sustainable way, we will need more than 265 million metric tons of additional protein a year – an increase of 50% compared to today. Insect proteins hold great potential in markets such as aquaculture and feed and food. By 2050, insects could account for 15% of global protein production. They are remarkably efficient in converting feed into protein and require little space to cultivate.

* According to the medium-variant projection; Sources: Bühler, United Nations – World Population Prospects, The 2015 Revision
tainable Food Processing group, which looks at the emerging food needs of society and their environmental, economic, and social impact. Part of his current research focuses on novel protein sources from algae and insects that can improve food security. Supporting Mathys has helped Bühler to further expand its knowledge on food safety and security, and insect processing. With the building blocks in place, Bühler was now on the lookout for an established insect production partner.

A chance meeting would lead to the next milestone. In 2015, Roberts attended the World Economic Forum Asian Meeting of New Champions in China. It was there that he met Kees Aarts, the founder and CEO of Protix. They had both registered to attend the same discussion group and during the coffee break started to chat. The next piece of the puzzle fell into place.

Innovators join forces
Protix, with its over 10 years of experience, is one of the most advanced companies in the world in the field of insect rearing and processing. The company has demonstrated industrial-scale production in a way that is scalable and multipliable. Over nearly a decade, the team at Protix gained extensive operational expertise in the breeding and rearing cycle, and also developed processes for separating and extracting proteins and lipids from insects. Having established themselves, they wanted to expand their business and were looking for a partner who could understand the specific requirements of large, industrial processors.

Scalable, industrial processing solutions
Bühler brings this expertise and more to the table, with over 150 years of experience in developing scalable, cost-effective, and hygienic plants and processes for food and feed products. It is also the recognized market leader in milling, which is one of the key steps for extracting protein from insects. “Our existing market access, process technology expertise, and global reach will enable us to bring these solutions to market quickly,” explains Roberts. “We believe that through this partnership we are the only company in the world that can truly provide industrial solutions for insect processing.”

Kees Aarts agrees: “We are seeing the birth of a new industry where reliability, predictable production, total solutions in engineering, and quality control all come together. This joint venture is defining the prerequisites of this new industry. Joint ventures like these can accelerate solutions and have a huge impact.”

Initially, the focus will be on larvae of the Black Soldier Fly, nicknamed the “Queen of waste trans-
formation” for its impressive ability to transform organic waste products into high-quality protein. The insect proteins will be used primarily for the production of animal feed, for example in aquaculture, which is the fastest-growing agricultural segment in the world. Fishmeal today is largely made from wild fish, exacerbating the problem of overfishing. Replacing this with insects is not only more sustainable but also more efficient [see graphic on page 71].

A joint venture is up and running in Liyang, China – a country with a longstanding tradition of using insects to feed animals like fish and poultry. As insects are also consumed directly by people in parts of Asia, the barriers to consumer acceptance of insect-based food products are much lower than in other parts of the world. China also offers favorable regulations for insect processing and has a large enough market to quickly reach a breakthrough in the industrial production of insects.

“We are all very excited to bring what Protix has built to an industrial scale,” says Andreas Aepli, CEO Bühler Insect Technology Solutions. “We have brought together a joint development team with people from Protix and Bühler to combine our engineering strength with their know-how on insects. The feed market in China is booming and we are ready.”
Did you know ...

... that together with leading universities and 20 corporate partners from eight countries across Europe, Bühler is engaged in the UNITECH network? It offers high-potential engineering students the chance to build skills in a cross-industry network via training and internships.

... that together with global leading companies including GEA Group, Givaudan, and Nestlé, Bühler is a founding partner of the MassChallenge Switzerland, the first start-up acceleration program of its kind in continental Europe?

... that Bühler aims at reducing energy consumption and waste at customer sites by 2020?

... that Bühler’s new generation of Tubex scales apply a revolutionary drive system that enables savings of up to 95% in energy consumption?

... that in the integrated food and nutrition center at EPFL Lausanne, Bühler has its finger on the pulse of food technology science by connecting directly with research groups at this top Swiss university?

... that Bühler operates a state-of-the-art analytical laboratory for the characterization of food and engineering materials to support customers with process design?

Ensuring the integrity of food in terms of safety

Food safety is one of the biggest challenges facing the global food system. The challenge is not only supplying enough to eat for a growing population, but also ensuring safety, nutrition and wholesomeness. Our Food Safety Officer talks about emerging threats such as mycotoxins and harmful bacteria in dry foods, and technology solutions such as post-harvest crop preservation, grain cleaning and microbial inactivation technologies to reduce food safety risks along the value chain.


A world of vegetable proteins with the bite of meat

Global protein demand is expected to go up by 265 million metric tons by 2050. This makes it necessary to come up with new types of sustainable protein-based consumer products. Vegetable proteins texturized using extruder technology are one interesting product category. In this publication we compare soy-based wet textrudates to products made from alternative raw materials. A focus is placed on pulses, oilseeds, and end-product properties.

The spirit of innovation and partnership

At the Bühler Networking Days, we invite people from across our industry to come together and learn about new solutions, be inspired by new opportunities, and talk about and create future innovations. Our aim is to collectively gain a better understanding of the challenges we face.

The first Bühler Networking Days, held in Uzwil in August 2016, was a remarkable event, with 750 people attending from every section of the industry – an industry that provides food for more than half the population of the planet every day. Four key themes formed the focus: sustainability, food safety, nutrition, and opportunities arising out of new technologies in the Internet of Things.

Together with our customers we were able to set Bühler’s sustainability targets: 30 percent energy reduction and 30 percent waste reduction for our customers by 2020. Ambitious? Yes, but with the support of the industry, we believe we can do it.

The future of protein was mapped out in our discussion groups. Following these discussions we announced earlier this year that our new Bühler Insect Technology Solutions business will provide insect protein for animal feed, starting first with chickens and aquaculture. The spirit of innovation and collaboration throughout the Bühler Networking Days 2016 was overwhelming. The question on many people’s lips was, when will the next one be? Well, we are already planning to return to Uzwil in 2019. But before that, there will be other key Networking Days events.

This year’s Networking Days 2017 @ Interpack takes place during the Interpack trade fair in Germany, where we will continue to drive forward the four themes of sustainability, food safety, nutrition and digitalization. We will also be showcasing start-ups and innovation programs. Along with the exhibit featuring technology and innovation solutions, there will be a dining and meeting area, and off-site events for discussions, meetings with start-ups, and opportunities to network. As always, our aim is to bring people together to exchange, create, and dream!

Our first Networking Days event dedicated to Advanced Materials is scheduled to take place in 2018 in China. It will be centered around lithium-ion battery business, with a focus on sustainable mobility. One of our key partners in this area will be the host of the event.

A food focused Networking Days at Ipack-Ima during 2018 will, again, headline the themes of sustainability, food safety, nutrition and digitalization. By the time we return to Uzwil for our Networking Days in 2019, it will be exciting to see how far our industry has progressed.

“As always, our aim is to bring people together to exchange, create, and dream!”

Ian Roberts, CTO Bühler Group