MEGATRENDS IN THE GLOBAL FOOD SYSTEM
How nutrition trends, sustainability, food safety, and the IoT are transforming the grain-processing industry

THE NEXT PROTEIN REVOLUTION
How Bühler exploits the potential of algae and insects for supplying a growing population with protein

SENSORS OF THE FUTURE
How Bühler is paving the way for smaller and more accurate optical sensors with a new coating process

FEEDING NINE BILLION PEOPLE IN A SUSTAINABLE WAY
FOCUS: MEGATRENDS IN THE GLOBAL FOOD SYSTEM
Feeding the growing world population in a sustainable way.

Technology & Solutions

Innovation in Conveying Systems
30 Tubo the all-rounder
The new Bühler conveying system requires less space than other mechanical conveying systems and thus allows much greater flexibility in plant design.

Sensor Technology

Sensors of the Future
Thanks to a new coating process for optical filters, Bühler is paving the way for smaller and more accurate sensors.

DataView

37 A quantum leap for die casting control
Bühler engineers have completely redesigned the control of die casting machines.

Internet of Things

40 The autopilot
Sensors in the roller mill Antares Plus continuously monitor granulation of the grinding product and automatically adjust the grinding gap for even the smallest deviations.

Automation Retrofit

42 Fitness program for the brain
By modernizing the the control system, the productivity of older plants in the food industry can be increased.

Interview

46 Cool as a smartphone
Patrik Müller, Head Automations Grains & Food, develops the next generation of WinCos with the look & feel of a smartphone.

Process Technologies

50 The power of knowledge
Bühler utilizes core processes such as extrusion in many different industries. Customers of all business sectors benefit from the exchange in knowledge.

Customer Stories

Veronesi, Italy

52 Tomorrow we’ll do even better
Salmonella or mycotoxins in animal feed? Cross-contamination? Not with Veronesi. How this Italian feed and meat group developed into the market leader on the basis of top quality.

Fine Chemicals Nigeria

Bringing colors back to life
Thanks to a complete system from Bühler, Fine Chemicals Nigeria is able to produce colors with higher quality – as well as lower raw material costs and loss of material. Africa’s first semi-automated color factory gives a new radiance to the colors of the continent and has helped Fine Chemicals to become the market leader in Nigeria.

Food for Thought

64 Smarter together
Digitalization is changing the way we develop products and drive innovations: close collaboration with customers is key.

Dear Reader,

By 2050 there will be nine billion people on earth. How can we provide them with healthy and safe food? It will take fresh ideas and new approaches. We need to rethink and transform agriculture and the food industry from within. This is the only way to solve this huge challenge. The grain processing industry plays a key role here – since corn, rice, and wheat are the most important staple foods for four billion people. And with the impending protein gap our industry will become even more important. We are therefore devoting this issue of Diagram to the megatrends that are changing our industry significantly: new trends in nutrition, food & feed safety, sustainability, and the Internet of Things.

These four megatrends also formed the main pillars of the Bühler Networking Days, which we organized for the first time in 2016. At this event we started discussing and shaping the future of our industry with opinion leaders from industry and science. Because these changes offer great opportunities: new trends and needs drive demand for innovative solutions, which we develop together with our customers and partners.

I wish you pleasant reading.

Stefan Scheiber, CEO
How we can feed nine billion people sustainably

Innovative nutrition solutions, greater sustainability, a high level of food safety, and the potential of the Internet of Things: Bühler points the way forward to the future of the grain-processing industry.
It is predicted that more than nine billion people will be living on earth in 2050. Feeding them all poses a huge challenge for our agricultural systems and the global food industry, for the simple reason that important resources are in increasingly short supply. At present, 30% of all fish stocks are considered overfished, 60% of them to their biological limits. With growing prosperity in the emerging nations, meat consumption is also set to rise: by 2050, it will probably have increased by 44%.

Even today, the production of animal protein via the route of feedstuffs made from cereal or oilseeds is no longer sustainable. Two-thirds of the 825 million tonnes of vegetable protein produced agriculturally each year in the form of rice, corn, wheat, or soy ends up in the stomachs of domestic livestock. Almost 80% of the soy bean harvest is used for animal feed. Tropical rainforest, in Brazil, for instance, is cleared to make way for its cultivation. “Intensive agriculture, factory farming, and fisheries cannot meet our needs in a sustainable or eco-friendly manner. To ensure that we can continue to feed a growing global population in the future, we need a revolution in the food system,” says Johannes Wick, CEO Grains & Food at Bühler.

Johannes Wick, CEO Grains & Food Bühler

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“”

CONSISTENT MILLING WITH MAXIMUM SAFETY

High food and operating safety standards combined with low maintenance requirements. The Convit four- and eight-roller mill grinds various different grain types safely and consistently.

Food safety is one of the most talked-about topics worldwide. At the same time, expectations regarding product quality, operating safety, and simplicity of maintenance continue to rise. Customers need cost-efficient grinding solutions that are still highly performing. This led Bühler to develop the Convit four- and eight roller mill. The machine grinds wheat, corn, rye, barley, spelt, and other grain types safely and with a high degree of consistency. Compared with its predecessors in the performance line, its outstanding feature is significantly higher food safety levels. The parts of the roller mill that come into contact with the product are no longer made of powder-coated sheet steel but exclusively of corrosion-free stainless steel or other materials suitable for food applications. In addition, the safety covers seal the roller mill and offer efficient protection against unauthorized access.

Bühler is also devoted to operating safety. Several critical parameters, such as roller release and rotation speed of the feeder roll are continuously monitored, improving both operating safety and quality of the end product. Furthermore, Convit requires very little maintenance. The transmission belt drive ensures a long service life and reliable, continuous operation. The Quick-Face roller package makes replacement faster and simpler, increasing operating time and improving overall roller mill efficiency. The Convit roller mill will be launched at the beginning of 2017.

HIGH-PERFORMANCE SCALE

Maximum food safety, 95% lower energy costs, and user-friendly operation: The new Tubex scale generation sets the standard for precision weighing.

Tubex scales are also highly energy-efficient. Instead of pneumatic cylinders, they use an innovative, electromechanical drive concept. Super capacitors store energy between driving cycles and reduce the power needed at start-up. As a result, the Tubex MSDN-L hopper scale, for example, reduces ongoing energy costs by 95%. Intelligent metering technology continuously monitors all major operating and service parameters, while the integrated diagnostic system provides early issue detection. The user-friendly control system works perfectly with mobile devices. Additional Tubex models round off existing scale systems. The new-generation MSDN-L hopper scale will be launched in spring 2017, with differential scales for free-flowing and non-free-flowing products and dosing elements to follow.

FOCUS / Nutrition

Innovation in nutrition

Hunger, micronutrient deficiencies, and overweight are the major issues we face when discussing the question of food. An estimated 840 million people suffer from hunger, and one third of the developing world’s population suffers from micro-nutrient deficiencies leading to blindness, retardation and early death, while the main problem for the industrialized nations and already a serious problem for the developing world is an overweight epidemic. Apart from this, there are indications of a huge protein shortage. “Our calculations have shown that to feed the world’s growing population we will require an additional 265 million tonnes of protein by 2050,” says Nadina Müller, Nutrition Programme Manager at Bühler. For this reason, Bühler is working on using the potential of alternative protein sources such as pulses, algae, or insects on an industrial scale to make food and feedstuffs (see also article on page 20).
Today, our eating habits are increasingly influenced by food intolerances and lifestyle trends. Clean-label products, with recognizable natural ingredients, are becoming increasingly popular. Health trends such as gluten-free result in about 30% of all Americans partially or completely avoiding foods containing gluten, despite the fact that not all of them are affected by gluten intolerance. The health benefits of processed cereals have also been questioned increasingly by consumers in recent years. This opens up opportunities in other grains such as oats, pulses, and quinoa.

Pulses as a nutritious alternative

Bühler is helping the grain-processing industry to take advantage of new opportunities in this dynamic market environment. These include pulse-based products. Pulses are gluten-free, satisfy hunger, and are high in proteins and dietary fibers. Peas and lentils can be processed into protein-rich flours, pasta, snacks, and even meat substitutes. Another interesting application is pasta made from wheat and pulses: this particular combination contains an optimum amount of essential amino acids.

“We have application centers worldwide where we work closely with our customers on new products with a strong emphasis on improving their nutritional profile,” explains Müller.

Eating habits are very strongly influenced by local customs. In East, North Africa, and the Indian subcontinent, for example, traditional breads such as chapatis are made from a fine whole-wheat flour known as Atta. In the CombiMill, Bühler has developed a grinding system that milling companies can use to make Atta as well as other dark or standard flours. “No matter what the raw materials,” Müller continues, “Bühler can achieve top-quality processing results with practically any cereal, including wheat, spelt, rye, barley, oats, rice, corn and millet, pseudocereals such as quinoa, amaranth and buckwheat, and, finally, oilseeds like soy, chia, and sunflower.” Every raw material, however, has its own specific properties and the processing stages must be precisely geared to accommodate them. In the case of quinoa, oats, or millet, for example, the high fat content poses a challenge. To reduce it, millet, for instance,

MAXIMUM FLEXIBILITY FOR THE MILLING INDUSTRY

Based on PesaMill technology, the CombiMill process allows whole-wheat flour for flatbreads, dark, and standard flours to be produced using the same milling system.

Flattbreads are an important staple food in India, Arab countries, and many African nations. The flour used for these flatbreads has specific properties, such as high water absorption. Indian Atta flour, for example, is traditionally made on stone mills. However, these mills consume vast amounts of energy and require tremendous maintenance. In addition, they are not suitable for hygiene-processing because abrasion of the stones and grinding agents may potentially contaminate the product. For these reasons, Bühler developed PesaMill. This high-compression mill grinds grain using a high-pressure shearing action, which generates extremely high temperatures. Compared with the stone mill, it has higher yields, improved food safety standards, requires less maintenance, and consumes significantly less energy.

Now, Bühler has successfully combined the PesaMill with traditional roller mill technology in a single milling system. The result is the CombiMill, which offers a high level of flexibility. In addition to the whole-wheat flour typically chosen for flatbreads, it is also ideal for the manufacture of other products, such as various types of dark and standard flours. This means that milling companies will now be able to successfully set themselves apart in the market by producing different kinds of end products with a single milling system. The first CombiMill machines are already up and running in the Middle East, North Africa, and the Indian subcontinent.

Following the milling of flour and farina, the ground products are conveyed to the planifiers. This process separates coarse particles from fine ones and puts the bigger ones through a second grinding phase. The process is repeated until all the particles have the desired particle size. With Novaprime, Bühler now offers a sieve fabric that is even better aligned with the specifications and performance of various planifier types. The sieve cloth is made of synthetic polyamide yarn. It provides maximum precision in terms of size and evenness of the mesh. In practice, the cleaning and homogeneous covering of the frames is a complicated and labor-intensive activity. For this reason, Bühler will offer a new terrifying service that meets the highest demands for hygiene and precision. In this way, we can ensure that no adhesive residue is left on the edges of the frames. Professional tending of the frames is an essential step to guarantee food safety and also improve separation results. The sieve tending service will be offered through Bühler’s worldwide network of service centers. The fact that we are – literally – close to our customers will ensure maximum planifier uptime and productivity. Novaprime is available as of December 2016. The ideal companion to Novaprime is Novablue, the new, innovative sieve cleaner from Bühler. With its striking color and the material used, it is easy to spot, both visually and through metal detectors, which is a critical food safety feature. With its innovative shape Novablue can replace traditional models with the same performance and completely avoid loose components in the end product. The innovative sieve cleaner is available as of January 2017.
Eliana Zamprogna, Sustainability Officer at Bühler. But higher energy efficiency isn’t just sustainable; it also makes economic sense. In the processing industries, energy accounts for up to 10% of total cost. So any saving translates directly into higher margins. In the latest Tubex hopper scale generation, for example, an electromechanical drive reduces operating energy costs by 95%.

And the potential is by no means exhausted. Around 60% of energy consumption in the processing industry is accounted for by process heat. Feed pelleted, breakfast cereals, and pasta have a certain moisture content during production but, ultimately, need to have a long storage life. The energy required for the drying processes is commensurately high. Thanks to an innovative heat exchange concept, the Ecothermatik dryer for long goods, for example, requires 40% less thermal energy. The cereal dryers in the EcoDry line are likewise among the most economical of their kind. In 2018, they were singled out for an award in the DGL Focus Test in the “Drying Efficiency and Energy Consumption” category. And they are sustainable in a second sense because they play a significant role in reducing losses after the harvest, too.

Increased sustainability is also a top priority for animal feed. In aquaculture, for instance, currently the fastest-growing section of the agricultural economy, fish farms are often criticized because they use fishmeal produced from fish caught in the wild as the basis for their feed. But with the use of Bühler’s extrusion technology, it is easy and efficient to give vegetable raw materials the necessary properties. “In the not-too-distant future, we’ll be looking into alternative protein sources such as algae or insects as feedstocks for fish and poultry,” explains Zamprogna.

MORE VARIETY IN PASTA – WITH AND WITHOUT GLUTEN

Wheat, corn, rice, pulses, or quinoa: The Polymatik pasta press offers maximum flexibility in the selection and combination of raw materials.

Pasta makers are increasingly searching for ways to respond to changing nutritional trends. At the same time, the demand is on the rise for products made locally by using raw materials into high-quality pasta is rising, such as corn and rice in China, or millet in Africa. The Polymatik pasta press from Bühler provides the necessary flexibility. After establishing it for wheat pasta, a new solution was developed for the production of gluten-free filling foods impress with their high protein and dietary fiber content. Another interesting combination is wheat and pulses. When combined, the two provide an optimum level of essential amino acids. Pulses can be added to pasta made of corn or rice, as they contain little dietary fiber. For health-conscious consumers, manufacturers can choose with pasta made from the dried product of pulses or the blood chia.

2016 marks the International Year of Pulses, and pasta made from lentils or peas is a promising innovation. These gluten-free filling foods impress with their high protein and dietary fiber content. Another interesting combination is wheat and pulses. When combined, the two provide an optimum level of essential amino acids. Pulses can be added to pasta made of corn or rice, as they contain little dietary fiber. For health-conscious consumers, manufacturers can choose with pasta made from the dried product of pulses or the blood chia.

MODERN HYGIENIC DESIGN AND CONSISTENT FLAKE QUALITY

Thanks to a new, simple, and sturdy design, Bühler’s new flaking mill for breakfast cereals and flakes offers significantly higher standards of hygiene. Automatic roll gap adjustment permits the manufacturing of flakes with very consistent quality even at high throughput rates.

Breakfast cereal flakes are nutritious, low in fat, and quickly prepared. For more and more people, they are part of their morning routine. One of the critical stages during their manufacture is the flaking process. Here, the raw material is compressed between two smooth rolls running in opposite directions in a flaking mill. Traditional centrifugal equipment, for example, are made from broken cobalt steel, in the case of oat flakes, the entire grain is flaked. For other applications, such as multi-grain flakes, extruded pellets are cut through the rolls.

Bühler has now developed a fundamentally redesigned flaking mill. Its most essential feature is significantly improved hygiene. Rounded corners and horizontal surfaces make it easy for the number of individual parts to be kept to a minimum. Parts are machined rapidly, through cleaning and in large numbers, to ensure food safety. Wide-opening doors and a fold-out cover permit total access to all components. Three not only make cleaning easier but also speed up service and maintenance work as well as roller replacements. It also increases uptime and productivity. The flaking mill now also features automatic gap adjustment. Whenever there is deviation from the reference value, the gap between the two rolls is automatically adjusted, thus ensuring consistent flake thickness androbust operation.

FOCUS / Nutrition

«We’re aiming for a 30% reduction in the energy consumed in all our core processes by 2020.»

Eliana Zamprogna, Sustainability Officer Bühler

FOCUS / Nutrition

«A high degree of safety calls for a balanced combination of measures that include threat analysis, process design, hygienic factories and machines, all combined with careful training.»

Béatrice Conde-Petit, Food Safety Officer Bühler

Food safety and hygienic design

In the years ahead, attention will increasingly turn to the topic of food safety. Hardly a day passes without news of some food that is either impure or has made people ill. According to WHO, over 200 illnesses are transmitted through food. Safety has assumed much greater importance in recent years. On the one hand, more and more food is being produced. On the other, new scientific insights and climate change have made the situation all the more dangerous. The food industry faces the risk of reputational damage, product recalls, or even legal consequences.

“A high degree of safety calls for a balanced combination of measures that include threat analysis, process design, hygienic factories and machines, all combined with careful training of personnel. Specialists from Bühler help customers all the way down the value chain to effectively combat potential threats such as bacteria, mold fungi, or foreign bodies,” says Béatrice Conde-Petit, Food Safety Officer at Bühler. One of the central issues is the efficient cleaning and sorting of cereals, which also plays a key role in reducing the presence of frequently toxic substances.
For certain types of end product, durum is treated in processing of high-quality end products. This treatment is a crucial stage in the further performance. The fact that there is hardly any abrasion improves hygiene and increases maximum performance.

For the use of diamond grinders has also led to significantly lower energy costs than is the case with traditional stones. The problem has been exacerbated by climate change. At one time, certain mycotoxins were found almost exclusively in tropical regions, but as a result of global warming have now also become more common in temperate regions, which occurs mainly in corn.

A multi-stage, high-performance cleaning sequence enables grain collection and storage units to identify and eliminate mold-affected grain and significantly reduces the occurrence of mycotoxins in wheat or corn. Mycotoxins are metabolites produced by fungi known as mold. Many of them are harmless, but some are extremely toxic, even in minimal concentrations, for both people and animals. You can check for color and specks during flour production. Other sensors measure moisture content and enable optimization of production in real time.

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How to feed nine billion people healthily and sustainably? Bühler addressed this challenge, together with customers, scientists, and partners at the Bühler Networking Days in August 2016. Around 750 participants took part in this key industry event. “We take the responsibility of the food and feed industry for a sustainable world very seriously. It is time to step up and make a difference,” said Stefan Scheiber, CEO of the Bühler Group. At the Bühler Networking Days, the company presented innovations that make a contribution to a sustainable food value chain, by increasing energy efficiency, yield, and quality, at lower costs.
Bühler showcased more than 30 innovations at the Bühler Networking Days, leveraging megatrends that are transforming the grain-processing industry: nutrition, food and feed safety, sustainability, and the Internet of Things (IoT). With every generation of solutions, Bühler aims at reducing the use of energy, water, and other resources by 30%. Every year, Bühler invests 5% of its turnover in research and development. The latest innovations include the CombiMill process with increased flexibility, a new generation of the high-precision scale Tubex, the energy-efficient pasta drying solution Ecothermat, and Novablue with increased food safety. Our customers awarded the innovative conveyor system Tubo as the most innovative solution at the event.

Innovation partner Comet received recognition for the development of the e-beam technology for food safety.

Bühler and Bosch jointly create IoT solutions for the food processing industry.

The innovative conveying system Tubo was awarded Best Innovation at the Bühler Networking Days.

Flatbreads made on Bühler atta flour solutions were a main attraction at the event.

With the Novatec innovation, the sieving process in flour mills has become safer and more reliable.

“Big bang” announcements highlighted the latest innovations shown at the Bühler Networking Days.
Addressing today’s challenges together

The challenges for the food industry are enormous. Around 65% of global water consumption and 28% of all energy use is related to food and feed production. The world population is predicted to grow to over 9 billion by 2050. Feeding them healthily and sustainably poses a huge challenge for the agricultural systems and the entire food industry. Bühler has made the commitment to address this challenge globally, with its network of customers and partners. Together, we can make a difference.

Panel discussions served to discuss key topics such as education of food safety.

important customers and partners, for instance Stefan Palzer from Nestlé, contributed to the success of the Bühler Networking Days.

The feedback was overwhelmingly positive. The event would not have been possible without all the customers, partners, and researchers who travelled to the Bühler headquarters.

«This is the first time I’m getting the meaning of IoT and how this can be applied in my mill. It’s wonderful.»
Mr. Rajkumar, Jayakrishna Flour Mills, India

«The knowledge I’m taking back home is invaluable!»
Customer from India

«Tremendous information. Tremendous for us. I hope Bühler will do it again!»
Real Tetrault from Emerson Milling in Canada

Find out more about our core topics nutrition, sustainability, IoT, and food safety.
In order to supply a growing world population with high-grade protein, pulses, algae, and insects will soon play a key role. Bühler is developing solutions to process them.

We need a protein revolution

In order to supply a growing world population with high-grade protein, pulses, algae, and insects will soon play a key role. Bühler is developing solutions to process them.
**FOCUS / Alternative Proteins**

**Enough protein for 18 billion vegans**
Up to 50% of the extra protein needed by 2050 could be obtained by eliminating waste. Today, some 30% of raw materials is lost, either because foods spoil, for example due to improper storage, or because consumers throw them away. The shortfall could also be reduced by a stronger focus on a vegetable-based diet. “If we were all to become vegans, we could provide food for 18 billion people with the protein volume produced today,” says Baumann. However, this is unlikely to happen: As the emerging countries become more prosperous, meat consumption is set to rise by as much as 44% by the year 2050. There is no way around the increased use of vegetable proteins. High hopes are pinned, among other things, on pulses. “These gluten-free sources of protein and fiber are appreciated by health-conscious consumers,” explains Baumann. In Asia and Africa chickpeas, lentils and beans have long been prominent staples. In Europe and North America they have somewhat sunk into oblivion. Thus, production volumes are rather small: Worldwide production today is just 77 million tonnes per year – 15 times less than corn and ten times less than rice or wheat.

The potential of pulses is still far from exhausted. And the processing technologies are available today: Bühler offers solutions for all major process steps such as cleaning, hulling, splitting, and sorting. With the Pulselock Pulse Huller, for instance, the hull of different pulses can be removed in an efficient, gentle and hygienic way: “Our processing technologies are tailored to different requirements with regard to capacity and safety. They easily meet the demands of highly regulated EU and US pulse processors,” explains Baumann.

**New products make pulses appealing**
A crucial point is downstream processing: “A criticism often leveled against pulses in the western hemisphere is that they require a lot of time to prepare and can cause bloating,” says Baumann. The challenge for the industry is to develop products with a high level of acceptance. Lentils and peas, for instance, could be transformed into high-protein flours for use as additives in bakery products or pasta. This is also interesting from a nutrition physiology point of view: The amino acids contained in pulses and wheat are highly complementary and, in their combination, are comparable to animal protein.

It is also possible to produce pasta with an attractive flavor and texture using only pulses. The “al dente” structure, which is typical for wheat pasta, however, must be obtained through the modification of the starch. Like in all gluten-free pasta products, the starch must perform the function of the gluten. With the Polymatik press, Bühler provides a production solution, which enables pulses and other raw materials to be processed into savory pasta products with the typical bite.

Last but not least, pulse flour can also be used to manufacture meat substitutes: “With the extrusion technology from Bühler, so-called texturates can be produced,” explains Baumann. Thereby, a protein concentrate is heated in the extruder. At high temperatures, the native protein chains denaturate. Upon exiting the die, the proteins are realigned and cross-link themselves. These texturates have a fibrous structure that comes very close to that of animal meat and they feel like real muscle meat when chewed. “Such novel products could make pulses more attractive for a wider circle of consumers because they do not have to change their dietary habits,” adds Baumann.

**Soybeans and fishmeal are unsustainable**
In the medium to long term, however, the use of new raw materials such as algae or insects is inevitable. They could, for example, be used as sustainable alternatives to feed based on, say, soybeans and fishmeal. Today, almost 80% of the global soybean harvest is processed into animal feeds. “The criticism for soy is directed towards the deforestation taking place, for example, in Brazil to generate new farming land,” says Baumann. Fishmeal, on the other hand, is largely made from wild-caught fish, exacerbating the problem of overfishing. In addition to sustainability aspects, economic reasons speak a clear language as well: The prices for soybeans and fishmeal tripled between 1994 and 2014.

Microalgae such as Chlorella and Spirulina stand out as high-grade sources of protein: “Their production does not compete with existing farming land. They grow quickly and take up very little space,” says Baumann, summing up their main advantages. Algae are cultivated in open ponds, or closed systems with tubes, enabling pulses and other raw materials to be processed into savory pasta products with the typical bite.

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FOCUS / Alternative Proteins

The protein contained in these cells can, for example, be processed into animal feed. Bühler provides solutions for the conditioning of the raw materials, as well as the extrusion of feed pellets for domestic or farmed animals. Other applications are found in the domain of food: Algae proteins allow the production of additives for bakery products, pasta, or snack foods as well as meat substitutes. Besides their different proteins, algae also contain high-grade polyunsaturated fatty acids or pigments, which can also be profitably utilized.

**Gentle rupturing of the algae cell walls**

Industrial-size plants for cultivating and processing on a large scale still remain to be developed. One critical processing step is the rupturing of the robust algae cell walls. In a research project, Bühler has demonstrated that agitated bead mills are the most cost-efficient mechanical method for this purpose today. This wet grinding technology is also used for the dispersion of high quality printing inks or coatings. Numerous small grinding beads are put into motion by a rotor. Stresses between the beads lead to the fine dispersion of the product. “A key aspect are shear forces induced by setting the liquid into motion, which allow a gentle disruption of the algae cell wall,” adds Baumann.

The protein contained in these cells can, for example, be processed into animal feed. Bühler provides solutions for the conditioning of the raw materials, as well as the extrusion of feed pellets for domestic or farmed animals. Other applications are found in the domain of food: Algae proteins allow the production of additives for bakery products, pasta, or snack foods as well as meat substitutes. Besides their different proteins, algae also contain high-grade polyunsaturated fatty acids or pigments, which can also be profitably utilized.

**Insects as an efficient protein source**

Like algae, insects offer much market potential. Mealworms or larvae of the black soldier fly can be fed with industrial by-products or even with waste. Moreover the feed conversion is very high. It needs only two kilograms of feed to build up one kilogram of insect mass. Like algae, they take up very little space: On one square meter, one kilogram of insect protein can be produced. Even though insects are consumed by humans in certain regions of the world such as Asia, it is as yet uncertain as to whether western consumers would accept insect-based food products. The primary focus for the time being, therefore, is on processing them into feed. “The protein in insect meal is very similar to that of fishmeal. It could be readily applied in feed for aquaculture and thus help to relieve pressure on natural fish populations,” says Baumann.

Until insects contribute substantially to feeding humans and animals, however, many challenges need to be addressed. In some countries, animal proteins have been banned from use in livestock feed since the BSE crisis. Also the large-scale rearing and processing of insects is still uncharted territory. “Bühler is currently setting up a pilot facility with a partner in China for processing fly larvae and mealworms on an industrial scale. The aim is to produce insect meal as a replacement for fishmeal plus a high-grade fat with properties similar to those of palm kernel oil,” explains Baumann.

**From soybeans to algae**

Bühler is driving the exploitation of alternative protein sources vigorously forward. Even though insects are consumed by humans in certain regions of the world such as Asia, it is as yet uncertain as to whether western consumers would accept insect-based food products. The primary focus for the time being, therefore, is on processing them into feed. “The protein in insect meal is very similar to that of fishmeal. It could be readily applied in feed for aquaculture and thus help to relieve pressure on natural fish populations,” says Baumann.

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«Alternative sources of proteins could be microalgae and insects. Insect meal is similar to fishmeal as a source of protein. It could be applied in aquaculture.»

Andreas Baumann, export for proteins at Bühler

The protein market will definitely become more diversified over the next few years. As the market and technology leader in the field of cleaning, drying, sorting, grinding, and extrusion processes, Bühler will play a key role in the processing of alternative sources of protein such as pulses, algae, or insects. “While the potential of pulses can already be used today, we are now developing the solutions required so that algae and insects can soon contribute to providing food for humans and animals,” Baumann concludes.

**Soybeans: Today’s established protein source for animal feed.**

**Pulses: Their commercialization is on the verge of a breakthrough also in the West.**

**Insects: Could be used in animal feed in the not-too-distant future.**

**Algae: In the future, it will be possible to extract proteins from algae for human consumption.**
Eating healthy made easy

It’s not difficult to eat healthy if we follow a few simple rules – and cook at home more often – says Richard Hurrell, former professor for human nutrition at ETH Zurich and consultant to WHO.

“Healthy nutrition is so important?”, Richard Hurrell: “It not only improves our general well-being, but also has a positive effect on our health. If we eat in a healthy and balanced way, we can reduce the risk of obesity-related problems such as high blood pressure or diabetes. While the origins of such diseases depend on a variety of different factors, one of which is genetics, a healthy nutrition can decrease the risk – in the same way as if we abstain from smoking, for example.”

Vegetarian diet, low-carb, or low-fat diets: not a day goes by without a new study that tells us what and how much to eat. It’s true that nutrition advice has changed regularly over the years, although we should distinguish between the consensus advice provided by the professional organizations, which is progressively updated as new science becomes generally accepted, and the advice given by authors who want to sell books or journalists who publish articles based on the results from single studies that catch attention. Because of the multifactorial risk factors associated with chronic diseases, many studies are needed to confirm a detrimental or beneficial effect of diet. Even then the level of risk or benefit can rarely be quantified. Journalists don’t want to wait that long.

Is obesity such a big issue? Yes, it is. More than one-third of U.S. adults are obese. Obesity drastically increases the risk of heart disease, stroke, or certain types of cancer. In the U.S., the estimated annual medical cost of obesity is around 150 billion every year. The obesity epidemic is due to a change in lifestyle. We have become more sedentary, particularly in our jobs and – because of the ready supply of inexpensive, tasty food – we are consuming more calories than we need in our daily lives.

What is the solution to this problem? Our lifestyle is dictated by the high intensity of our daily activities related to job, family, and hobbies. Many people don’t have the time, the knowledge, or the inclination to cook at home. A balanced nutrition would be quite easy if we cooked most of our food ourselves: If we just went to the supermarket and bought fresh produce such as meat, fish, vegetables, and fruit, then supplemented these products with the traditional processed foods like cheese, milk or ham. Instead of doing this, many people are consuming manufactured convenience foods or are eating regularly in restaurants.

What’s wrong with eating in restaurants? It would be possible to eat a balanced diet from restaurant meals but recent scientific studies have shown that food in restaurants – and I mean not just fast food restaurants, but all restaurants – contains 10% more calories, 10% more salt, and 10% more fats compared to the meals we prepare at home. The extra fat and salt makes it taste better. I would like to see more effort in teaching young adolescents how to cook. It’s not difficult at all to make tasty meals using fresh ingredients and some additional spices and herbs.

“...than we need in our daily lives. More than one-third of U.S. adults are obese. In the U.S., the estimated annual medical cost of obesity is around 150 billion every year.”

Richard Hurrell, ETH-Professor for human nutrition
So how would you describe a healthy diet?

As a basis for a healthy and balanced diet, I would recommend starting with the classical Mediterranean diet. Fish and meat, a lot of fresh vegetables, and some fruit, olive oil replacing most of the butter and margarine, some rice, potatoes, and pasta. Instead of white flour products, I would advise whole grain bakery products. The beneficial effects of this diet on cardiovascular health have been proven in countless scientific studies. There are fewer incidents of cardiovascular diseases in Southern Europe in comparison to Northern Europe, for example.

What are we not allowed to eat?

I think it is unnecessary to prohibit any individual food completely. But based on our current knowledge, I would strongly advise limiting certain groups of foods.

What foods do you have in mind?

I would recommend limiting eating between meals so as to decrease the intake of excess calories. This would include potato crisps, snacks, and nuts, as well as candy bars, confectionary, ice cream, and high sugar carbonated beverages. I would suggest consuming fried foods and mayonnaise in moderation as well as manufactured foods with added sugars such as fruit yogurt or cookies. Processed meat products such as salami, bacon or frankfurters and barbecued foods should also be consumed in moderation as there is strong evidence that they contain potential carcinogens. As far as drinking is concerned: Have mineral or tap water with your meals instead of sugar containing soft drinks - and consume alcoholic beverages in moderation. A glass of red wine per day, however, is good for the heart.

FIGHTING OBESITY WITH GUT MICROBES

Most of us think of bacteria as something bad and try to eliminate them wherever possible. In the case of our digestion, the opposite is true – our gut health depends strongly on the right set of organisms living in our gut. Recent findings show that it does not stop there – the same microorganisms determine to a large extent whether we stay healthy or are prone to illness. We host billions of microbes in our gut, more than there are people living on planet earth. These microbes play a role in maintaining our health through the production of immunomodulatory products like short-chain fatty acids. It has been demonstrated over a decade ago that diet has a considerable effect on the composition of our gut microbiota and our gut health. These findings initiated the development of probiotic yoghurts. Now, recent evidence suggests there is even a link between the composition of gut microbiota and our overall health, i.e. a link to obesity and related non-communicable diseases, like metabolic issues, but also to immune and inflammatory responses.

Researchers have found clear differences in gut microbiota between children from Burkina Faso, who eat a diet very high in fiber, to peers in urban Europe. Data suggest that a lower fiber intake has a negative impact on our intestinal microbiota and interestingly, there are very few if any cases of allergies and asthma in certain rural African regions. These and other findings on the link between diet, gut microbiota, and health open up entirely new approaches to human disease treatment. Bühler is cooperating with leading nutrition institutes in order to test new approaches to ameliorate human gut microflora and to understand what influence on our health the various raw materials have that are processed by Bühler machines.

OVERWEIGHT & OBESITY

THE BIGGER PICTURE

Worldwide obesity has more than doubled since 1980

41 million children under the age of 5 were overweight or obese in 2014

39% of adults aged 16 years and over were overweight in 2014

IMPACT ON PERSONAL HEALTH

attributable to overweight and obesity

DIABETES 44%

HEART DISEASE 23%

CANCER 7-41%

IMPACT ON ECONOMY

HEALTHCARE COST

up to USD 2,500 annually per person

PROFITABILITY LOSSES

up to USD 4,300 annually per person

HOW YOU CAN PREVENT

Make healthy food choices

Serve at least five servings of vegetables and fruit daily

Reduce screen time

Drink water, instead of sugared beverages

Keep track of your weight, body mass index, and waist circumference

Balance energy in and energy out

Chain drives, elevators, belt and screw conveyors. The world of mechanical conveying systems is based on inventions hundreds of years old. With Tubo, everything is different: The first and only tubular conveying system in the world that uses individual pusher elements for continuous conveying, was recently launched.

Tubo comes from Spanish and means tube. The name is indicative of the beginnings of this innovative transport system from Bühler: The essential features of Tubo were developed in Bühler Madrid. The name fits like a glove, because on the exterior of Tubo, only one tube can be seen – the inside is where the system’s real secret is hidden.Contained in the housing there are individual Tubit pusher elements that convey bulk goods such as grains, rice, malt or others.

A quantum leap
Rolf Kamps, who works in the development department of the business area Grain Logistics, is considered the spiritual father of the pusher element conveying system, officially known as Tubo. In 2012, Kamps refined the system’s original idea and brought about a quantum leap in conveyor technology. Tubo can be considered a disruptive innovation because all elements related to previous mechanical transport systems pull. Tubo, however, “pushes” “individual” conveying elements.

In 2013, Bühler began to develop its first plants and overall solutions on the basis of Kamps’ work. Reto Rechsteiner, Product Manager at Grain Logistics says: “What makes Tubo particularly attractive is that each area considers a different advantage of Tubo to be profitable.” In coffee and nut processing, the main advantage would be the gentle handling and hygienic material transport – product conveyance is conducted with no residue and piping is completely emptied, which lowers the cleaning effort. With its three-dimensional line guidance, Tubo enables entirely new plant concepts in rice mills, which in turn reduce customers’ investments in buildings and structure. In most breweries, on the other hand, it is the three-dimensional piping and the elimination of explosion protection that is considered the most advantageous.

In short: Next to chain drives, elevators, belt and screw conveyors, Tubo forms a fifth group of mechanical conveying systems, which offers new, additional options. Although Tubo is most closely related to pneumatic solutions with its hygienic and flexible transport management, Tubo is far more energy efficient than pneumatics, as there is no air treatment, or pressure and vacuum build-up.

In use from Thun to Jeju
The first Tubo plant went into operation in 2014 at Mühle Burgholz AG, a feed mill not far from Thun in the Canton of Bern, Switzerland. In 2015, the Locher and Meckatzer breweries were added to the list of customers in the brewing sector. “The brewers’ interest for Tubo grew after the pilot project in Thun, because they often have to transport goods in cramped conditions in existing plants,” said Rechsteiner. In this regard, Tubo offers new solutions, because it allows for the three-dimensional transport of bulk material around existing plants, reduces the number of transfer points, requires considerably less space, and thus allows much greater flexibility in plant design.

Transport distances with Tubo of up to 30 meters and a capacity of 18 tonnes per hour in brewery plants has been approved. “We have to gain more experience and competencies regarding this revolutionary system and are therefore gradually rolling it out,” said Rechsteiner. The next brewery project is already lined up: The South Korean brewery Jeju Island located on the island of the same name is next to install Tubo.

Cost benefits
At a vertical transfer speed of more than one meter per second, precautions must be taken with regards to explosion protection, since sparks could be produced when metal comes into contact with metal. Since Tubo as a vertical transport solution conveys at a speed slower than one meter per second, the risk of generating sparks is eliminated, which represents a clear cost advantage: Because explosion protection measures massively increase the costs of conveying systems.

Tubo, the all-rounder
The new Bühler conveying system requires much less space than other mechanical conveying systems and thus allows much greater flexibility in plant design.

AREAS OF APPLICATION

- Wheat
- Barley
- Malt
- Rice
- Pellets
- Coffee beans
- Nuts
- Soybeans

The areas of application of Tubo are diverse.
Since 2014, the Brauerei Locher located in picturesque Appenzell, Switzerland, has been operating the largest and most complex Tubo system. Seven Tubo piping lines connect Bühler machines, which grind 4.5 tonnes of malt ever hour in addition to receiving, weighing, and cleaning 18 tonnes of barley. Karl Locher is part of the fifth generation to lead the Locher Brewery. He is enthusiastic about the innovative conveying system – and also has high expectations.

Mr. Locher, why did you choose to operate Bühler machines in the new brewery too?

The new building was designed to last the next five generations. Since the plants in the old brewery have run smoothly for almost a hundred years, anything but the highest quality was out of the question for the new brewery, and thus we placed our confidence in Bühler. I hope that the new equipment isn’t like an iPhone, which has to be replaced every four years – so that my children in the sixth generation and their children can benefit from the plant.

What specific advantage do you have with the new Tubo plant?

There is less wear in product conveyance, it uses less energy and we are able to produce more beer with less space. The new brewery perfectly demonstrates how Tubo makes the most of space. Thanks to the seamless connections of Tubo, we can forgo certain explosion protection measures and thus reduce production costs.

What enables the optimized use of space?

With the three-dimensional Tubo piping system, we are able to convey around tighter corners in the new brewery, than would ever have been possible with the two-dimensional chain, trough chain and pneumatic conveying systems in the old brewery. In practice, the solution is extremely efficient – it is truly a joy to brew beer with the new plant.

Another cost advantage that Tubo offers is its ability to provide lower conveyance heights for sophisticated plant layouts. This means that by employing Tubo, buildings, in which the plants are located, do not need be as high as other plants equipped with transport systems. Moreover, reducing the conveyance height also saves energy.

Despite all these advantages, Tubo does not compete with other Bühler solutions, as the capacity makes a difference: Tubo operates at a maximum of 20 tonnes per hour, whereas chain conveyors and elevators first show their strength starting at a capacity of this magnitude and go up to 1000 tonnes per hour. For many food processors, however, a throughput of less than 20 tonnes is of great interest. “Tubo fills this gap and ideally complements the Bühler portfolio,” said Rechsteiner.

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Would you like to know more?

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A late summer afternoon in August. The sun burns. Is my skin at risk? Your smartwatch knows. A built-in optical sensor filters the harmful UV radiation out of the light and outputs the data to the watch, alerting the wearer. This example shows how optical sensors make our lives easier. The application fields are immense and far from being exhausted: Sensors can be used to control lighting with a smartphone. Operators can control machines directly, simply by using gestures. And there are sensors that can detect nearby objects. These sense, for example, when we inadvertently touch the screen while speaking on the phone and ensure that our call is not interrupted. New applications emerge almost every day. Accordingly, the market is growing rapidly: The industry’s well-known OSD Report 2015 from IC Insights market research company expects an annual sales growth of 10% for the most common optical sensors.

Directly to the wafer

Optical sensors are created in production sites around the world using a standard procedure. Up to 10,000 sensors can currently be manufactured simultaneously on a one-millimeter thick and eight-inch wide semiconductor silicon plate. Due to their waffle-like structure, these are called wafers. The process is complicated and takes time: The silicon wafer runs through the factory for two to three months. At the end of production, the filter is applied, which filters the right light from the spectrum. For this, hundreds of thin layers are stacked precisely on top of each other. To date, filters were applied to a separate glass, which was then cut and glued onto the wafer. The quality and stability that could be achieved with this method, however, was no longer sufficient for some customers. “Several customers asked if it would be possible to apply the filter directly onto the wafer,” says Harro Hagedorn, Team Leader of Process Development & Application Optics. “We took on this customer request and developed a customized process.” The result is a patented process, which is compatible with the paints used in the structuring processes. In areas that are to remain uncoated, a protective varnish is applied. Then, the wafer is coated all over. The coating material is atomized in a vacuum chamber by generating a plasma and bombardment it with ions. This is deposited as a layer just a few nanometers thick. The varnish in the protected areas is then dissolved. What remains is the structure of the filter.

“Thanks to a new coating process for optical filters, Bühler is paving the way for smaller and more accurate sensors.”

Source: IMEC

Technologie- & Lösungsmarketing
Up to two hundred such layers of different materials are stacked on top of each other to form a single filter. The varnish in the protected areas is then dissolved. What remains is the structure of the filter on the unprotected areas of the wafer. In order to integrate a variety of optical filters on the wafer, the so-called lithography process can be repeated as often as desired. Then, the silicon wafer is completed. Now the sensors can be cut, packaged, equipped with terminals, and integrated into a printed circuit board.

**IOT HEROES**

Self-driving cars. Refrigerators that order milk on their own. What sounded utopian until recently, is gradually becoming part of our daily lives. The Internet of Things (IoT) is taking shape. According to a Gartner report, 6 billion devices communicate with each other today. By 2020, this number is expected to reach 20 billion. Sensors make this possible. They detect the chemical, physical or material nature of their environment and transmit information as an electronic signal. Even today, 60 to 100 sensors are installed in a single car. By 2020, this is expected to increase to 200 according to the MEMS Journal. That is over 250 billion sensors for vehicles alone.

In the food industry, use of sensors is also on the rise. They are key to improved efficiency and traceability. Bühler is currently conducting several research projects. Together with Bosch, Bühler has developed the use of MEMS sensors for real-time measurement of temperature and pressure in roller mills. Currently, developments are underway to use the data to increase efficiency. The first products are expected to hit the market in 2017. Together with IBM, Bühler tested how a robot could support millers, for example, at night. The first pilot test is now underway at a mill in Germany and will continue until the end of the year.

**ADDET VALUE**
- Perfect product performance in the first run
- 2x faster
- 2x larger areas possible
- Layers of 3 nanometers
- Large packages - 40 microns
- Scattering and absorption losses < 10-100 parts per million

**Highest level of precision**

Hagedorn expects the Bühler process to become the standard in filter coating. “The filter can be produced in a more economic manner with our process, because we integrate more components on the same area and can process large quantities at the same time.” In addition, the process offers extremely good optical filter properties. Dispersion and absorption losses of merely 10 to 100 parts per million incident photons are possible. This is a decisive advantage, because the smaller the losses, the more precise the sensor. “There are very few procedures that ever reach this level of precision,” said Hagedorn. In addition, layers can be applied to the wafer that are thinner than 3 nanometers. Conventional methods are unable to reach less than 10 nanometers. Layers that are three times thinner provide product designers with new possibilities. Steeper edges are also possible and new forms can be created. All this allows even smaller sensors with improved optical properties to be produced. After successful sampling, the first customer has already put several plants into operation and the first products with the new sensors are already on the market.

**A quantum leap for die casting control**

What use is the best machine if its application is too complex and overwhelms the user? This question led Bühler engineers to completely redesign the control of die casting machines. They were able to take a quantum leap in the control of die casting cells.
Complex systems, overloaded operators
Controlling complete die-casting cells requires complex and capable systems. These have to control and monitor not only the actual die-casting process, but also cover the peripherals of a die-casting cell: dosing, the removal robot, spraying systems, trimming press, vacuum systems, the conveyor, as well as forming and temperature control systems. Keeping the relevant process information manageable and getting to the crux of the matter is not always easy. “You make excellent systems, but users are overwhelmed with the operation,” was a common complaint.

The development team at Bühler Die Casting took this customer feedback to heart. Together with specialists in user interface design, they fundamentally redesigned the operation of die-casting controls. With the innovative user interface DataView, they took a quantum leap toward intuitive machine control. “It is as if we had switched from Windows 95 to a modern operating system,” says Laszlo Jud, Head of Automation at Bühler Die Casting. The first prototype was presented at the last Foundry Trade Fair (GIFA) in Düsseldorf. Since then, the solution has been successfully put into operation for select customers in the harsh foundry environment.

Intuitive control
“With DataView we have developed a control system that is distinguished by convenience and intuitive operation. Similar to a smartphone,” says Mimmo Chieco, Product Manager for DataView. The die-casting cell can be operated via a touch screen and minimal manual control elements. The latter is particularly important when the industry environment only permits rough handling. The time savings for operators are clear: The fast and intuitive control reduces programming time by up to 25%. In addition, the time required for maintenance and training is significantly lower. And lastly, pilot customers appreciate being able to access data in real time via mobile devices such as tablets.

Steps towards the Internet of Things
DataView is enabling die-casting to take its first steps towards the Internet of Things. “All operations and changes are captured digitally. We can reconstruct and optimize each millisecond of the die-casting process,” said Jud. This has significant advantages, especially with regard to recalls in the automotive industry. Thanks to precise traceability, it is now possible to accurately isolate faulty pressure castings. “It makes a difference whether 20,000 parts have to be recalled or only 2,000,” says Chieco. The diverse diagnostic options are another advantage of the new machine control. In a simple manner, even “health checks” can be carried out in real-time as well as monitoring of a machine’s condition. They can be used, for example, to monitor and optimize energy consumption of the various elements of a die-casting cell. And the inventors have already begun thinking about the next step. “Diagnosis is good, but prognosis is better,” says Jud. “With the data generated, we will be able to identify and prevent potential problems in advance within the next few years.” Currently, developers are working on making the clear advantages of this innovative system available for other series, such as the Evolution. The customers showed their thanks with positive feedback: “The operation is simply more intuitive, which is visible immediately. All information that is relevant for operation is always available. It’s impressive,” says Srdjan Paunovic, Head Foundry at Wagner AG in Switzerland.

Would you like to know more?
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ADDENDUM
Quick and intuitive cell control via touch screens
+25% faster programming time
Precise control of the die-casting process
Access with mobile devices such as tablets

«The operation is simple and intuitive, which is visible immediately. Information that is relevant for operation is always available. It’s impressive.»
Srdjan Paunovic, Head Foundry at Wagner AG
The autopilot

Sensors in the roller mill Antares Plus continuously monitor granulation of the grinding product—and automatically adjust the grinding gap for even the smallest deviations.

Intelligent parking aids or sensors that measure the distance to the vehicle ahead and maintain a minimum distance now belong to the standard equipment of modern vehicles. And soon, self-driving cars will chauffeur us to our destinations entirely on their own while we read the newspaper or work. Comparable leaps in technology are currently emerging in the food industry: The plants are continually becoming smarter and are able to make important decisions, sometimes completely independently.

One example is the roller mill Antares Plus from Bühler. By using various sensors, it continuously monitors the particle size distribution of the grinding product. Once the granulation deviates from the set point, the grinding gap is adjusted by an adjusting motor—automatically and in real time. Thanks to integrated online measuring and monitoring, Antares Plus always uses the optimum grinding degree. This ensures consistent product quality and increases yield. Since the grinding process is always able to operate within an ideal range, the bottom line also requires less energy. The millers are noticeably disburdened, because with conventional systems, they must regularly take and check samples by hand.

Antares Plus is also equipped with sensors that monitor the temperature of the rollers and the roller bearings. If they become too hot, an alarm is triggered, a notification is sent, or the plant is stopped. Because overheating of the components can be prevented, the product quality is consistent and at the same time, operational and personnel safety is significantly improved.

Antares Plus is thus able to demonstrate the potential of “fully automated mills” even today: An even greater degree of automation and integrated intelligence enable simple and proactive maintenance, higher productivity and yield, increased safety, maximum availability, as well as reduced energy and operating costs.

Would you like to know more?
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ADDED VALUE
- Consistent product quality
- Increased yield
- Reduced energy and operating costs
By modernizing control and automation, the productivity of older plants in the food industry can be increased. For this specific reason, Bühler has developed a special fitness program.

Fitness program for the brain

While the mechanics of plant parts from, for example, a roller mill, a cleaning machine, or an extruder can be maintained at a good level for decades, the life expectancy of control and automation is much shorter. The development of software and hardware is so rapid that updates and the necessary electronic spare parts are quickly no longer available. The result: The brain of a plant ages, while the body continues to operate with optimal performance. In addition, the requirements for food producers are intensified by legal regulations or market developments. Control and automation must continually feature new functionalities such as product tracking and online measurement of quality parameters or validations.

Fitness program for old machines

The consequences of outdated control or automation prone to defects are obvious: Breakdowns reduce the availability of the plant due to unexpected downtime, missing functionalities reduce competitiveness and can lead to lower yield and quality.

To facilitate the modernization of production plants in the food industry, Bühler has developed a fitness program for control and automation. The Automation Retrofit service concept consists of an entire catalog of solutions, whose portfolio is continuously updated. It covers all levels of automation: machine control, electrical and communications infrastructure, as well as hardware and software for plant controls.

Custom solutions

Not every ailing control and automation system requires the same retrofit package. Bühler specialists inspect every plant in great detail and design customized solutions – even for plants of third parties. Once the fitness program has been defined, the preliminary work is completed mostly in the offices and laboratories of Bühler. On-site work includes the installation of new hardware and, if necessary, minor adjustments to individual plant parts. After extensive testing, the conversion takes place within a very short time, minimizing production downtime.

Benefits for our customers

Depending on the scope of the fitness program, the benefits for the plant operator are great or at times even massive. By simply upgrading the software, the probability of breakdowns occurring and feared downtimes are reduced. In general, the availability of the plant is improved. The retrofit program also increases the level of automation, improving efficiency and the quality of production due to continuous measurements and advanced control circuits. Furthermore, continuous production data enables decisions to be made faster and more accurately.

Finally, modernization of control and automation reduces costs. Expenditure for maintenance and servicing is reduced. In addition, possible investments in the plant can be carried out at a later date thanks to improved automation. And last but not least, optimized plants consume less energy.

GROUPE MINOTERIES SA, SWITZERLAND

Full conversion in just one day

Groupe Minoteries SA commissioned Bühler to comprehensively renew the control of a mill that processes 260 tonnes and operates 24 hours a day and to retrofit the entire automation. Moreover, the customer wanted to use the mill in a more flexible manner. For the time of the conversion, the mill was supposed to be at standstill for no more than one day.

« Bühler is not just the only provider of automation solutions, but the best. It is important to me that everyone involved knows each other personally and that people using their skills are at the center of the project. »

Olivier Piot, Production Manager Moulins de Granges (Groupe Minoteries SA)

• Completely new software WinCos
• 3 new servers
• 3 new programmable logic controllers (PLCs)
• 15 new operator stations, from wheat intake to bagging
• Design of software for the recipe-dependent control of 200 path switches

Thanks to precise preparation, detailed simulation of the new software at Bühler, and full-scale tests at the plant in Granges, the new automation system was able to take over the control of the entire production of Moulins de Granges in 2016 with just the turn of a key.

ADDET VALUE

+ Yield improvement
+ Data-driven decisions
+ Efficiency increase
+ Higher availability
+ Improved operational security
+ Higher food safety
+ More uptime
+ Lower depreciation
+ Improved warehouse management
ETIHAD MILLS (JOINT VENTURE LOULIS MILLS UND AL DAHRA), UNITED ARAB EMIRATES

Record speed

The bulk storage silo built in 2013 by a third-party supplier failed to meet the requirements for plant flexibility, product traceability, and food safety. The trouble was compounded by basic software problems related to ease of operation and troubleshooting. Therefore, in 2015 Bühler was entrusted with the order to replace the control system of the bulk storage facility and to link it with the ship unloader located at a distance of 1.5 km. The focus of the assignment was on safe storage and monitoring of the grain. In addition, the integration of the feed and flour mills planned for a later date was to be taken into account.

Bühler solution

- Automation concept
- New sensor system
- Exchange of silo software
- Upgrade of ship loader and unloader software
- New control cabinets
- Training
- Integration of maintenance software ProPlant

The software offers the following features: automatic route navigation, product traceability, integration of ship loaders and unloaders, logging and stock management, incorporation of 12,000 temperature measurement points with temperature-dependent ventilation, monitoring of the energy supply, and 24/7 remote maintenance.

"We are more than satisfied with the result of the retrofit. We have found that Bühler with its powerful set of competencies is the right partner for such complex automation tasks. Bühler completed the assignment within eight months – which looks like record speed."

Andreas Tsolos, Technical Director Loulis Mills S.A.

FAZER SMOLENSKAYA BAKERY, RUSSIA

Most important part of the plant

The plant controls of the proportioning system (intake up to kneader supply line) installed in 1998 were fully automated, but no longer operated reliably due to outdated software and electronic components. In March 2015, Fazer entrusted Bühler with the order to renew the plant control system and the operating elements in order to upgrade old unsupported equipment and software. The plant was to be shut down for the shortest possible period of time for the rebuild.

Bühler solution

- 7 intake raw material points
- 17 kneader feeding installations
- Various flour transfer and liquid transfer lines including the weighing system and several liquids, syrup and honey preparation systems.

The new plant control system has advanced fault diagnostic and detailed records of the performed job and material consumption. In order to minimize the downtime of the plant, all the processes were subjected to intensive tests at Bühler and the switch-over was painstakingly prepared. The actual change-over took a mere three days over the Russian New Year’s holiday.

"The system for proportioning the flour and liquid ingredients is the most important part of any industrial-scale bakery. Just one little error or a system failure would mean the worst case. We have therefore entrusted the renewal of our automation system to Bühler as a proven partner and have not been disappointed."

Dmitry Lezhin, Chief Electronic Engineer Fazer Smolenskaya Bakery
can measure protein and ash content, humidity and other parameters in real time. Our customers have maximum transparency when it comes to determining the quality of the final products, optimizing those products and selling them at the best prices. It also means that we have seamless traceability, which is absolutely indispensable today when it comes to certifying food product safety.

And for Bühler?

We’re developing a range of completely new services geared to generating added value. One of these is predictive maintenance, which enables us to guarantee high machine availability. Our customers no longer pay flat-rate hours for service technicians but allow us to share in their higher output and performance – which is effectively the same as profit sharing.

What does that mean in technological terms?

Machine control systems will be significantly more intelligent. Intelligence will be decentralized. Plant controls will make it possible to trace the entire production sequence, from the delivery of raw materials through the processing phase to packaging and delivery. For every finished pack of flour, pasta, or nuts, it will be possible to say who delivered the raw material and on what machines, using exactly what parameters, it was processed.

And where’s the data evaluated and analyzed?

Analysis of the data is increasingly taking place in the cloud.

Aren’t there lots of clients who have reservations about entrusting their operational data to third parties?

Sure, there are still plenty of people who have their doubts, the same way there are with any new technology. But I’m confident we’ll gradually overcome them.

As cool as a smartphone

Patrik Müller develops controls with the look and feel of a smartphone at Bühler. In our interview, the Head of Automation Grains & Food talks about the benefits connectivity brings to everyday industrial environments.

INTERVIEW: BÜRKHARD BÖNDEL – PICTURES: ANJA METZGER

“...comparable with the first analog, machine-based industrial revolution. In future our machines will have a lot more control loops to be able to optimize the processes themselves.”
PATRIK MÜLLER
Head Automations Grains & Food

Patrik Müller has headed the Automation department of the Bühler Grains & Food business since 2014. Some of his current projects include – beside the mobile PocketPlant plant monitoring system – a new plant control user interface and a completely new generation of embedded machine control systems. Müller’s fascination for the world of automation began early on. He started his career at Bühler as an Automation apprentice 26 years ago. He then deepened his knowledge in an information technology studies program at the St. Gallen University of Applied Science, driven by his enthusiasm for his discipline, he systematically continued his career: In his next professional stages, Patrik Müller – today 43 years old – climbed the Automation ladder from programmer, project manager, group leader, and head of development to his current position. He rounded off his technical skills in 2009 by obtaining a Master of Advanced Studies ZFH in Business Administration degree from the Zürich University of Applied Science in Winterthur.

How many more years will we have to wait before that kind of scenario is a reality?
Two, perhaps three: the pace of development is breathtaking.

And in the meantime?
We’re getting the first versions out onto the market. But the process isn’t digital, in the sense of all or nothing. It’s more of a flow process. Last year, Industrial Milling was already in a position to unveil the Antares Plus. It’s a roller mill equipped with lots of sensors, which enable it to set the roller gap for optimum efficiency autonomously. On the control side, we’re also launching a new generation of WinCos, which is already capable of covering certain processes. On top of that, WinCos has also given us an entirely new form of operator guidance.

What is new and improved with the new WinCos operator guidance?
WinCos is as cool as an iPhone. It all starts with the new design. In terms of graphics, it is much more reminiscent of consumer devices than old, traditional industrial control systems. It continues with a new type of user guidance, which is operated intuitively. And last but not least, the control system is web-compatible, which means I can display it on mobile devices. No matter where the user is in the facility, WinCos goes with him. Even at home. This opens the door to a completely new level of flexibility. There’s no longer any need for a conventional control room in the plant.

But isn’t it all a bit of a gimmick?
That’s what one of our pilot customers thought at first. Over a year ago, when we asked him about his requirements and whether he’d be interested in mobile control units, he turned us down. Then, a few weeks ago, we showed him the first prototype.

And what was his reaction?
He was very interested. He told us to forget what he’d said about the use of mobile devices a year ago. If Bühler could deliver what he’d just seen in the demo, we should give him a call.

Everything at your fingertips: The user interface of the new WinCos plant operating system.
Bühler utilizes core processes such as extrusion in many different industries. Customers of all business sectors benefit from the exchange in knowledge.

Wheat, pasta, pulses and battery paste, pigments, polymers – the raw materials could not be more different. Yet core processes in their treatment are based on the same technologies: “We have a range of core processes that we master completely. Depending on the task, we select the appropriate process technology to develop a customized solution,” says Markus Hofer, Head of Business Development Advanced Materials at Bühler.

One example of this is extrusion. In extruders, various raw materials are continuously processed into a homogeneous mass according to the principle of screw conveying and pressed through a shape-giving opening. These plants were originally developed for applications in non-food areas, such as the production of cables made of rubber. The first application for Bühler was form extrusion in pasta production. Later, the so-called cooking extrusion was added. Here, the mass is briefly yet strongly heated in the extruder. Upon exiting the nozzle, the steam evaporates and the extrudate expands promptly. With this process, snacks, breakfast cereals, feed, and also modified flours and starches, for example, are produced. In the food industry, extruders are popular because they integrate multiple steps such as mixing, kneading, pressing, and forming into one continuous process.

Extrusion technology in Chinese batteries
Extrusion technology from Bühler can also be found in other areas – for example, in the production of pencil leads, slug pellets, or binders for printing inks. “Many small particles can be efficiently and uniformly moistened with liquid in the extruder,” says Hofer. Continuous mixing has also been focus of the most recent extruder application: the production of electrode slurry for lithium-ion batteries. The challenge here is not to change the structure of the active components, such as nanoscale lithium iron phosphate, but rather to finely disperse it in the carrier medium. The continuous production process with a twin-screw extruder from Bühler is currently being implemented on an industrial scale by the Chinese battery maker Lishen in a new factory. Compared to batch processes previously used, the new process enables higher efficiency, lower production costs, and a more consistent quality.

Active exchange in knowledge creates value for customers
Driven by the specific applications, the individual business units at Bühler have particular expert knowledge in various sub-areas of extrusion. For example, for Advanced Materials applications, such as production of battery slurries, the exact dosing of raw materials is absolutely critical. For food and feed, however, nozzle technology is often more developed, because the shape is a key success factor.

“At Bühler, active exchange in knowledge takes place between process engineers from the different business divisions. Our goal is to continually develop and refine the process technologies – which benefits all customers,” states Hofer. Another example of a flexible applicable process is wet grinding in agitator bead mills. Such plants are often used for the production of printing inks or coatings. Here, color pigments are ground by countless small grinding media under a constant load and uniformly inserted into a binder. A similar method is also applied in the production of chocolate, in order to process cocoa powder, sugar, fat or oil into a homogeneous mass. In the future, agitator bead mills could even play a key role in the industrial use of alternative sources of protein for human nutrition: In a research project, Bühler has demonstrated that these are the most efficient mechanical methods for breaking the tough cell walls of algae and extracting the valuable contents.

Would you like to know more?
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What do pencil leads, breakfast cereal, and electrode pastes for lithium-ion batteries have in common? In the production of all these products, extrusion technology from Bühler plays a key role. This example illustrates how Bühler utilizes select core processes both in the food industry as well as for various other applications. All customers benefit from the rigorous exchange of knowledge among business divisions.
Tomorrow we’ll do even better

Salmonellae, mycotoxin in animal feed? Cross-contamination? Not with Veronesi. How this Italian feed and meat group developed into the market leader on the basis of top quality.

TEXT AND PICTURES: BURKHARD BÖNDEL

The procedure takes less than five minutes for the analysis of impurities, moisture content, protein content, fiber content, ash content, starch content, mycotoxin (aflatoxin, Deoxynivalenol, Zearalenone, Fumonisin).

Monday, May 2, 8:45 am, Italy, on the outskirts of Verona. A truck is waiting at the factory gate of Veronesi for permission to enter the premises and unload its 30 tonnes of grain. The animal feed production line needs to be resupplied just in time. But before the driver is given the go-ahead, he must make a stop. A special suction nozzle fully automatically draws a raw material sample of about ten kilograms and pumps it into the laboratory just a few meters away from the stop. In a matter of a few minutes, the truckload is analyzed for its impurities, moisture content, protein content, fiber content, ash content, starch content, mycotoxin. The truck load fails to meet this stringent quality standard. The truck must turn around without having accomplished its task.

The EU limit for aflatoxinB1 contamination is 20 parts per billion (ppb) – which is about the same as if 200 people of the entire global population were sick. But even this is too much for Veronesi. The threshold value for the Italians is 3 ppb, that is 20 people in the world. The truck load fails to meet this stringent quality standard. The truck must turn around without having accomplished its task.
But this is the exception. Every day, 70 trucks arrive at the plant near Verona, which on average processes 2,000 tonnes of material in four work shifts. The annual production for the seven Veronesi facilities in Italy is 3.3 million tonnes. But it is precisely the exception that illustrates the stringent quality understanding that has marked Veronesi for decades and transformed it into the Italian market leader for poultry meat, ham, and sausages: “We cannot allow even one defective batch to enter our feed production process,” says Massimo Zanini, CEO of Veronesi.

Food Safety, this is Veronesi’s firm belief, starts with Feed Safety.

In order to do justice to this claim, the company has joined all the process operations into a painstakingly timed, highly standardized and automated system – feed manufacture, animal production, slaughtering, processing, and logistics – and focused each single step in the process on top quality.

This starts as early as the selection of the raw materials. “We buy our raw materials solely from approved dealers that know our quality requirements,” says Paolo Gelmini, Quality Manager of Veronesi. And one of the peculiarities of the factory in Verona is that it only processes raw materials that have not been genetically manipulated (GMO free).

Reliably destroy any bacteria
Building on this basic philosophy, Veronesi then also pays special attention to ensuring hygienic production of its feeds. One important element in this effort is to heat the feed during the tightly controlled pelleting process for about 60 seconds to a temperature of over 85 degrees Celsius in order to reliably destroy any bacteria that may be present. This process takes advantage of the Bühler HySys Hygienization System, which meets maximum requirements in terms of pathogenic microorganism reduction and microbiological product quality. Its production of hygienized compound feeds guarantees animal feed at the highest level of sanitation. “Hysis simplifies, improves, and secures our entire pelleting process,” explains Luca Buttura, Plant Process Engineer at Veronesi. Hygiene is therefore also the top criterion in livestock production, slaughtering, processing, and delivery of the finished goods.

A unique automation system integrates all the cleaning, grinding, mixing, pelleting, and heating system components. About 80% of all parts has been supplied by Bühler – the two companies have been closely associated since the beginnings of Veronesi. This is particularly true of the lean and flexible automation system, which is based on the Bühler Acos standard. Veronesi and Bühler have been working on this automation system for some 40 years now, continuously refining and perfecting it. Today, thousands of sensors measure a wide range of quality parameters such as temperature, pressure, time, weight, or strength, feeding them to the system to allow online monitoring of all the process steps and parameters. “We can inspect all the production operations in all our factories from a single centralized point, making sure that everything is running as planned,” says Gianfranco Pandolfo, Production Manager.

Full traceability
This enables the company to prove what has been processed and when it has been processed along the entire process chain whenever required. Anyone in a supermarket buying a package of poultry meat, ham, or salami produced by Veronesi can retrace the process chain as far back as to the feed that has been fed to the individual chicken, hog, or cow and can see how production took place.

“Tackling feed safety hazards can be the following: Contamination by mycotoxins (e.g. aflatoxin in milks, which are toxic by-products from fungal infection of the raw material), contamination with bacteria-like salmonella (e.g. in eggs and poultry), and pests like insects, mites, or rodents. Incorrect composition of feed, in particular regarding feed additive concentration, is another risk that needs to be managed. Finally, chemical contaminants like dioxin and heavy metals are also potential risks. Ideally, the problem of contaminated grains should be tackled at the root cause by minimizing the risk of mold fungi growth. Proper drying and storing of the harvested grains is key. However, if the grains still show elevated levels of mycotoxin, then the next processing steps become essential to eliminate the toxin from the feed and food value chain. The combination of mechanical cleaning, aspiration of light fractions, and advanced optical sorting is seen as the most effective control measure and can reduce the levels of mycotoxin significantly.”
Veronesi is the biggest Italian feed producer with seven plants across Italy. The company's headquarters are still in Verona, where founder Cavaliere del Lavoro Apollinare Veronesi built the first plant almost 60 years ago. Shortly after, they became a Bühler customer. Nowadays, they run one of the most advanced feed plants in Europe, especially from an automation point of view, using only up-to-date technology and equipment. The company is still family-owned and produces mainly feed for chickens, turkeys, layers, pigs, ruminants, rabbits, and fish. They announced an annual feed production of 3.3 million tonnes in 2015; 75% of it is integrated, meaning they run their own farms and produce feed for their own use. About 25% of their output is commercially sold in the market using its own brand.

Veronesi is one of the most advanced feed milling companies in Europe. “Our goal is to not just produce feed, our goal is to bring healthy and tasty meat to the consumer,” says Massimo Zanin, CEO at Veronesi. Almost 60 years ago, the Italian company started to produce high-quality animal feed, nowadays in seven plants across Italy. They put great emphasis on feed safety, and therefore also on quality control, automation, and traceability. To achieve their ambitious goals, they have partnered with Bühler — for 50 years already. One of their targets is to reach a zero cross-contamination level. Cross-contamination or carry-over happen due to the presence of substances which according to the formulation do not belong to the feed, but have been carried over from the previously processed batches. Therefore, all process steps have to be connected with the most advanced mechanical and pneumatic transports in order to reduce cross-contamination to the minimum. But also the control of all these transports and process steps during feed production is essential. Online monitoring, and with it total traceability, is crucial nowadays. For instance, in case of a recall due to salmonella contamination, the feed miller needs to backtrack every single step of the production process and trace every feed batch back to its origin. Veronesi strongly believes in full automation of their processes, which can also act as a booster of feed safety on the basis of ensuring uniformity and standardization of the production.

Empirically established processes

Thus for years, Veronesi has been practicing what is now taking hold of the entire feed manufacturing industry as a trend. And that is a good thing. For on a global scale, one of the biggest hazards posed by poultry-based food products such as eggs and meat is the presence of salmonella, which can result in serious food-borne illness or even death of people. Salmonella is found on many raw materials. It can survive for years in a dry environment and is relatively heat-resistant, in particular when heat is applied under low-moisture conditions.

Reducing the risk of salmonellosis for end consumers requires a value chain approach — just like the one applied by Veronesi. By extrapolating the advances made in other fields — for example dairy processing — to the feed industry, feed manufacturing is expected to change from an empirically established process to a science-based process design with validated kill steps and customized feed qualities using advanced process control systems. To achieve this, more knowledge of the kinetics of salmonella inactivation in relation to other feed quality factors must be gained. Also, greater feed safety awareness and more education of grain and feed processors is required. Finally, the main focus must remain in place: to ensure feed safety as part of the effort to increase the overall efficiency and sustainability of the entire value chain from grain to feed to food. This is the main goal of the Bühler Feed & Food Safety Initiative.

And Veronesi itself is also busy further perfecting its system. “Our principle is the following: Tomorrow we’ll do even better,” says CEO Zanin. The general conditions are in constant motion, with new toxins emerging, regulations changing, consumers making new demands, and innovative chemical and process technologies opening up new opportunities. Therefore, one important goal for the future is to further reduce the use of antibiotics in feed: “Again, this is an area where we want to be the trend-setter,” says CEO Zanin.

The extent to which Veronesi is propelling developments is evidenced by its latest investment worth over three million euros in a new laboratory. “It currently takes us a few days to analyze some parameters such as GMO — but by then the material will already have been processed,” says Quality Manager Paolo Gelmini. Veronesi therefore now plans to determine also these values within just a few minutes in order to decide whether and how the raw material will be used in production.

For some trucks, this may once again mean: Stop! Only top quality is admitted to the process — to achieve the required product quality and thus to meet customers’ needs.

Would you like to know more?

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Bringing colors back to life

Thanks to a complete system from Bühler, Fine Chemicals Nigeria is able to produce colors with higher quality – as well as lower raw material costs and loss of material. Africa’s first semi-automatic color factory gives a new radiance to the colors of the continent and has helped Fine Chemicals to become the market leader in Nigeria.

November 2013, in Shanghai at the world’s largest inks and coatings trade fair, the China Coat. Providers loudly praise their latest innovations and vie for the attention of customers. Without reserve, competitors photograph new products and try to find out the specifications and prices. In the midst of this bazaar-like commotion: Rajeev Samant, the Operating Manager of Fine Chemicals Nigeria Ltd, who navigates through the turmoil along with his Formulation Specialist Sharad Lambe.

Samant has been responsible for production at the Nigerian ink manufacturer since the beginning of the year. He has been in the color and packaging business in Nigeria for 26 years already and knows his craft inside and out. But what has now taken him to China are challenges which give him headaches even as a serene expert. These challenges are the ever-present problems at Fine Chemicals: “Customers regularly complained about the color quality,” Samant recalls, “and we had difficulties with the production volumes and occupational safety.”

Samant had assumptions as to why the company was unable to provide the desired quality: the defects at the plant are obvious; the factory site looks run down and the manual processes that Fine Chemicals uses to produce colors are also part of the problem. Samant says, “The formulations were occasionally deviated due to human error during day-to-day operations.” How he could get these problems under control within a reasonable amount of time, was something he was unsure of.

Fine Chemicals obtained two older Bühler bead mills of the type BOA and two Bühler three-roller mills of the type SDV 1300 from a bankrupt paint manufacturer, which had been in operation in Nigeria since the late eighties. The old machines work perfectly – they are, however, operated inefficiently. Workers push mixing containers around the site and fill them with solvents and pigments, mix the batches at another location and then bring the containers to the machines, where the contents are ground.

But it is not only the lack of organization that was causing inefficiency. The climate was also up against Samant. In the sweltering heat of Nigeria, where daytime temperatures rarely fall below 30 degrees Celsius, the workers combine pigments and other ingredients in the air in plastic buckets. Here, large amounts of solvents fizzle out; production losses are thus correspondingly high and also the working conditions leave much to be desired: They use plastic buckets to pour the ingredients together and sometimes mix them with their bare hands. From an environmental perspective, the operation cannot be justified, as the emissions are too high.

And yet Samant still sees potential for the company. He plans to turn Fine Chemicals into a market leader. “It became apparent early on that Nigeria’s population increase would provide our business with a sustainable tailwind, especially with regards to packaging for the food industry,” says Samant. At the same time, he knows that he has to bring operations rapidly back on track, in order for the company to benefit from this trend.
tem. Traber understands the challenge right away, because he recently built similar plants in China and the concepts are still fresh in his mind. Samant’s mood brightens as he listens to Traber. Then it dawns on him: This contact could be the turnaround moment for his business. With the certainty of having found Bühler as a partner who understands his needs and can provide a customized solution, he boards the plane to head back to Nigeria.

From single machines to the plant offer

After arriving in Nigeria, Samant requests an offer from Bühler for a Cenomic 3 horizontal full-volume agitated bead mill. A common procedure in order to gain a sense of the magnitude of the investment during the first budget period; the customer quickly calculates the cost of the required amount of equipment himself. Also in this case: As the responsible Area Manager Daniel Troxler discusses the offer with Samant on the phone, it soon becomes clear that he and his workers not only need individual machines, but also support with setting up an entire plant.

After the Technical Project Manager Marco Lemmenmeier had spoken with Samant about his needs in more detail, Bühler met with Samant and a senior company representative from Dubai in August 2014 for a first project meeting on site. They defined the formulations and processes and came up with a preliminary design: This included layout plans, indication drawings for building and steel construction as well as equipment specifications. At the same time, Lemmenmeier and his team created a detailed offer, which they wrapped up in the same month. The planning for the plant started two months later in October 2014, the installation began in September 2015 and was completed by the end of the year.

"Along with our request from Bühler, we also asked a competitor," Samant reveals today. But the flexibility and transparency at Bühler were the decisive factors that spoke in favor of the Swiss company: “Bühler did not just deliver machines and vanish,” said Samant. “Instead, Bühler intensively supervised all of the steps.”

Rajeev Samant, Operating Manager of Fine Chemicals Nigeria Ltd.
The investment came just at the right time.

Rajeev Samant, Operating Manager of Fine Chemicals Nigeria Ltd

Samant is optimistic about the future. The food industry in the country is doing very well and the population growth in Nigeria continues to support his business, in particular the flexible packaging industry, which buys about two thirds of the colors. Fine Chemicals has now opened the doors of its new production plant to multinational companies that produce in Nigeria. “They prefer us because of our higher quality,” he says. Also the direct clients, the printers, are raving. Thanks to the improved dispersion of the color, their impression cylinders now last over 8,000 meters in the case of white. Since white has a high absorptive and the cylinders are under great stress, the service life was previously limited to only 3,000 meters. Moreover, the new white is now clearly white.

Meanwhile, Fine Chemicals is the market leader in Nigeria and controls over 60 percent of the market in Africa’s largest economy. Thanks to the expanded process knowledge, Fine Chemicals plans to enter into printing woven carrier bags, in which products such as rice are sold. Also new formulations for cardboard printing are underway. “Thanks to Bühler we are able to further develop our company and our product portfolio,” says Samant. Expanding its export is next: Neighboring countries such as Ghana and Togo are at the top of the list.

To find the right partner for its expansion, Samant now no longer needs to fly to China. With the rich colors from the Bühler plant, he has already found the right solution for the colorful life of West Africa.

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Bühler has made the most of its international supply chain for the Fine Chemicals group. Around one third of the parts and machines came from India, China, and Europe.

The first step in the production process is to moisten and break apart the so-called agglomerates in high-performance mixers. Next, the pre-mixed color goes into the bead mill, which uses grinding beads made of ceramic to finely grind the material. This step is crucial: The better the grinding, the better the quality characteristics such as gloss or color strength. In turn, this allows the necessary percentage of pigments to be reduced, which results in lower manufacturing costs.

In order to use the bead mills as efficiently as possible, so-called concentrates are ground: To enable a higher output in a shorter period of time, the more concentrated color is diluted with solvents, binders and additives only after fine grinding. For colors such as blue, two passes through the bead mill are sufficient: for more delicate colors like black, three passes are necessary to achieve the appropriate color strength. Color changes take place, if possible, from light to dark, to minimize the need for cleaning between the individual batches.

After the wet grinding step, it is time for blending, which further dilutes the mixture until all of the parameters correspond to the final formulation. A column mixer then briefly mixes the total product, then, after all the components of a color have been mixed together, it undergoes a color test. The workers compare the color strength and coverage of the batches with a color sample approved by the customer. “Thanks to the extremely fine and uniform distribution of the color pigments that is possible with the Bühler bead mills, ink manufacturers such as Fine Chemicals can add additional solvent to the basic recipe, which often exceeds the quality specifications. By thus being able to use fewer solids, the yield is further increased by several percentage points.”

Since the color pigments in their raw state are still quite luminous, the first step in the production process is to moisten and break apart the so-called agglomerates. By thus being able to use fewer solids, Bühler made the most of its international supply chain for the Fine Chemicals group. Around one third of the parts and machines came from India, China, and Europe.

Africa’s first semi-automatic color factory

The result is impressive. Lemmenmeier and his team transformed the building of an old paint production site in Sango Otta, not far north of the center of Lagos into the first semi-automatic color factory in Africa within two years. In addition to the four old renovated Bühler machines, three new Cenomic 3, six high-performance mixers and a Tri-nomic 1300 three-roller mill for high viscosity colors as well as seven mixing tanks for binder preparation and two white production lines, each with a mixed color and finished color tank. The plant components are fed from a new, central tank farm located outside the factory, nine small-volume liquid receivers and three bucket-presses for the roller mills.

Lemmenmeier and his team developed a special solution for Fine Chemicals: Not a fully automated plant, but rather a process that is standardized only to a certain degree and thus allows the formulation to be manually adjusted in an uncomplicated manner like before. In short: A concept adapted to the African production conditions, which builds on well-established workflows and can cope with irregular power outages. “Thanks to their balance between automation and manual operation, the system corresponds exactly to the customer’s needs,” said Lemmenmeier. Also, given the large variety of colors with a manageable amount of tonnage, around 300 tonnes of paint per month, full automation was neither reasonable nor requested: “We did not want to set up a plant that in the end, the customer would not want to operate due to sheer ‘awe,’” said Lemmenmeier.

By operating valves, a single worker today mixes the binders and colors, which flow into the hall after being triggered at the tank farm. A software program also leads the worker through each step of the production process by way of job tickets. The ticket tells him when and how many kilograms of which ingredient to add and the software constantly monitors the respective dosing by using scales in the background.

Rapid amortization possible

Samant did not regret his decision: “The investment came just at the right time,” said the lively sixty-year-old. After the massive devaluation of the Nigerian currency Naira in spring 2016, the conditions once again became much more difficult. But aside from the additional obstacles in purchasing equipment and raw materials, the sharp fall in sales even benefits Fine Chemicals: “Since foreign currency and thus imported goods are scarce, local establishments pay everything out of our hands that they can pay for in Naira.”

The new plant draws the attention of customers and the competition. “Everyone is impressed,” says Samant. And Samant is too: “Bühler has kept all its promises.” Thanks to the new Bühler plant, Fine Chemicals was able to significantly reduce its material losses. The plant, which cost over five million Swiss francs, around three million francs of which for the portion delivered by Bühler, will pay for itself within six to seven years simply through the reduction of raw material losses. Combined with increased productivity, the plant is likely to amortize in five to six years.

A crucial factor for the reduction of material losses was improving the environmental conditions in the plant: Whereas workers previously mixed the colors outdoors in open buckets, they now do so in a controlled, air-conditioned environment. For the cooler the product, the less solvents will evaporate. Not only the building as a whole, but the suspended binder mixing tanks are also now all water-cooled and sealed. The mixing containers for small batches can now be closed with covers and the lids of the column mixers are all connected to the central aspiration. Less evaporation and selective extraction reduces air pollution in the plant and also increases the occupational safety and working conditions for the personnel.

Production is expanded

Not only the quality, but also the efficiency of the new plant is remarkable. In the old plant, three workers required 12 to 18 hours to produce 400 kg of color in a sequential mixing and dispersing process. Now, a machine operator and an assistant produce up to a tonne of color in less than ten hours. Four assistants and four machine operators now operate the new plant. In a ten-hour shift, they produce six tonnes of white and up to three tonnes of other colors.

In the future, Fine Chemicals plans to produce more than 440 tonnes per month. And this with eight instead of twelve workers. Soon, the machinery will be expanded by another three Cenomic 3: one will produce white at the same time as the existing bead mill, which is the most commonly used color. The other two bead mills will be installed in order to replace the Bühler ROA-125 mills.
Smarter together

Digitalization changes the way we develop products and drive innovations: close collaboration with customers is key.

New technologies unlock the potential for new business models. They disrupt the status quo and enable new services and solutions to be launched. It is the world of digitalization, of experimentation, and accelerated innovation. This new age asks for innovation that combines the knowledge and skills that have stood us in such good stead in the past with the skills and dynamism of the new economy. At Bühler, we aim to become your preferred partner for innovation, because we are convinced that a win-win collaboration will make both partners stronger.

For almost a decade we have utilized collaborative platforms to bring together the innovation power of all our employees. This year, almost 4,000 employees, that is more than one-third of our global workforce, engaged in our Innovation Challenge, submitting ideas, developing them, and also selecting the ideas to be turned into business. And we would be delighted to involve more partners in this program.

This marks a major step for Bühler. With global actors, such as Givaudan, Nestlé, GEA, and Barry Callebaut as founding partners of MassChallenge Switzerland it has found its first accelerator program in mainland Europe.

Why did we do this? We at Bühler feel they represent the innovation culture that we need to continue our story of success in the digital age. What further convinced us, MassChallenge is an NGO and takes no equity in the start-ups. What is more, this initiative provides a rigorous selection process that identifies and develops highly talented start-ups, which become extremely interesting for partnerships. You will find all of these exciting start-ups under this link: http://masschallenge.org/programs/switzerland.

This marks a major step for Bühler. With global leaders, such as Givaudan, Nestlé, GEA, and Barry Callebaut as founding partners of MassChallenge Switzerland, we have the strongest food and processing ecosystems to support start-ups. And we would be delighted to involve more partners in this program.

Scientific Publications

BESIDES THEIR DAILY JOB, BÜHLER SPECIALISTS CONTRIBUTE TO SCIENTIFIC PUBLICATIONS. HERE’S A SELECTION.

1 Joining forces to highlight the unique food safety challenges of low-moisture foods

Bühler is proud to be an active member of a European team of experts on food safety, which has reviewed mechanisms employed by Salmonella spp., Shiga toxin producing E. coli, Cronobacter spp., Listeria monocytogenes and Campylobacter spp. to tolerate osmotic and desiccation stresses. The review identified gaps in knowledge, which need to be addressed to ensure the safety of low water activity and desiccated food products.

Reference:
The response of foodborne pathogens to osmotic and desiccation stresses in the food chain.
Catherine M. Bargeaux, Andrea Gianetti, Nadia Gruden, John Mihelc, Susanne Kranich, Angela Luthe, Enidie Mabaga (Bühler AG), Stephane Sorel de Faver, Silviane Sela (Stéierlange), Odile Trousse
International Journal of Food Microbiology 221 (2016) 37–53

2 Not all meat substitutes are equally sustainable

The production of various meat substitutes (plant-based, mycoprotein-based, dairy-based, and animal-based substitutes) aims to reduce the environmental impact caused by livestock. This article outlines the comparative analysis of meat substitutes’ environmental performance in order to estimate the most promising options and shows that lab-grown and mycoprotein-based analogues perform worst, while insect-based and soy meal-based substitutes and chicken have the best impact.

Reference:
This paper was co-written by Prof. Alexander Mathys, the new Assistant Professor in Sustainable Food Processing at ETH Zürich, sponsored by Migros and Bühler AG. Alexander Mathys is focusing on increasing the efficiency and sustainability of value chains in food and feed.
Meat alternatives: life cycle assessment of most known meat substitutes
Sergiy Smetana, Alexander Mathys, Achen Krait & Valaker Perez
The International Journal of Life Cycle Assessment, ISSN 0948-3349, DOI 10.1007/s11367-015-0931-6

3 Bühler Food Engineering Award for young researchers in the food industry

At the 10th European PhD Workshop on Food Engineering and Technology, Bühler awarded the Bühler Food Engineering Award for the first time. The award was presented to Josef Hirmansperger for developing a quality-preserving microbial decontamination method for food powders such as milk powder. Josef Hirmansperger obtained his PhD degree from ETH Zurich, co-sponsored within a CTI project in which HEYSO Valais was involved as the applicant. With the Food Engineering Award, Bühler wants to encourage young researchers to address issues that are particularly relevant for the food industry.

Reference:
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Bühler Food Engineering Award for young researchers in the food industry

Stephan Schmitz Esser, Shlomo Sela (Saldinger), Odile Trousse
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