FOCUS: KNOWLEDGE GIVES POWER

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Dear Customers

What does the future hold in store for Switzerland as a business location? Shouldn’t high costs and a strong Swiss Franc dictate that we move our production operations abroad as quickly as possible? And just how important is “Swissness” for Bühler?

When choosing a business location, the pros and cons it offers must be carefully weighed. With this in mind, it’s clear that Switzerland offers plenty that tips the scale in its favor. One example is our dual educational system, which is a huge locational advantage. Our universities and vocational schools turn out highly qualified graduates at all levels. This allows us to hire capable employees and provides us with a network to help drive our innovation. It’s also a reason why we’re the envy of the entire world. We’re now beginning to export this model for success: to the Americas, to China and, most recently, to Africa (see pages 6–11). The second big advantage that often goes overlooked is the existence of peaceful labor relations, an achievement that continues to prove extremely valuable. Part of this is our adaptable labor legislation. In Switzerland, this gives us a level of flexibility that you won’t find anywhere else in the world. Without it, we would never have been able to agree with our employees on an extra hour of work per day with no additional compensation in just two weeks’ time. But there’s more: We also benefit from access to solid infrastructure as well as efficient public administration and banking. All of these aspects are key factors in a globally competitive market, and they also make us a stronger organization.

Bühler is both a global company and a Swiss business. That’s why – as in recent years – we’re once again pressing ahead with our regionalization efforts (for example, by opening additional service locations) while also strengthening the heart of Bühler at our Uzwil location in Switzerland. In all of these steps, we have the full support of our shareholders, the Bühler family. This approach ensures our continued ability to develop, produce and ultimately provide our customers with quality and technology that meet Swiss standards – from any location around the world.
Knowledge Gives Power

Basic and further education, training courses and training events are a key feature of Bühler’s product and solution portfolio. Because high-end technologies require high-end knowledge to succeed.

Knowing how

How can I prevent porosities in the component during die casting and thus assure high quality? How can I ensure that the correct parts are sorted out in optical sorting? How can I increase the efficiency of a mill? By what parameters can I optimally control surface coating in order to produce energy-efficient façade glass panels? It is a huge error to think that highly automated processes and plants require less know-how on the human side. Machines and solutions can only be as good as they are understood and mastered. Over the past few years, Bühler has therefore established a global network of over 25 education and training centers that cover all business segments in order to provide its customers and employees with the requisite know-how.
How Bühler Generates Knowledge

After three years of planning and construction, Bühler is opening its African Milling School in Nairobi, Kenya. This is Bühler’s contribution to helping the continent to further develop its key industry by improving the training of its millers.

Until now, Luis was a reasonable miller – but he hadn’t been trained. In the 15 years in which he ran a production plant in Maputo, Mozambique, he often wondered about musty smelling grain that could sometimes no longer be processed.

A few weeks ago, Luis learned the cause. And better yet, he knows what he can do about it. Grain is an organic raw material and it breathes. If it’s stored in the silo for a few weeks, the breathing creates heat and moisture. To dry the valuable material, Luis used to switch on the ventilation – but in the daytime so that warm air flowed through the grain.

When the warm air meets the cool grain, it makes it even damper – it’s the start of a vicious cycle.

Since the beginning of March, Luis has been a student at the Bühler African Milling School in Nairobi, Kenya. And, within just a few weeks, his instructor Martin Schlauri has already taught him what to do if grain gets damp: “You have to switch on the ventilation at night,” explains the Bühler specialist, who has been in the milling industry for more than thirty years. The cold night air gets warmer when used in the ventilation and is able to absorb the moisture in the raw mate-
By participating more effectively in the global production of goods and services, Africa can transform its economy and achieve a development breakthrough, according to the latest African Economic Outlook, released at the African Development Bank Group’s Annual Meetings. The continent’s growth is projected to accelerate to 5–6 percent in 2015, levels which have not been seen since the global economic crisis of 2009. Africa’s economic growth is more broad-based, argues the report, driven by domestic demand, infrastructure and increased continental trade in manufactured goods. “In order to sustain the economic growth and ensure that it creates opportunities for all, African countries should continue to rebuild shock absorbers and exercise prudent macro management,” said Mthuli Ncube, Chief Economist and Vice-President of the African Development Bank.

The report argues that more effective participation in regional and global value chains – the range of activities in different countries that bring a product from conception to delivery to the consumer – could serve as a springboard for Africa in economic diversification, domestic resource mobilization and investments in critical infrastructure. In order to do so, however, the continent needs to avoid getting stuck in low value added activities. “African economies have a great potential to build on their demographic dynamism, rapid urbanization and natural resources assets. The challenge now for many of them is to ensure that greater insertion into global value chains is achieved and has a positive impact on people’s lives,” said Mario Pezzini, Director of the OECD Development Center. The African Economic Outlook shows that there has been remarkable progress in human development, with lower poverty levels, rising incomes and improving rates of school enrollment and health coverage. Further achieving real human development gains requires empowering people and ensuring environmental sustainability, so that economic growth can yield benefits for all. In order for value chains to effectively integrate the poor and marginalized, often including women, targeted public policies and inclusive business models should facilitate access to productive assets such as land and financing, enhance productivity and improve the resilience of small producers.

Nairobi is the logical continuation of this success story in which customer focus goes hand in hand with social responsibility and our own business interests.

The idea to build the African Milling School came about four years ago. “Many of our African customers not only want to buy production plants from us, but qualified personnel too,” explains Martin Schlauri. Until now, it has been predominantly qualified expatriates carrying out the work. To get good training, the African employees were sent to Europe to attend short courses or the Swiss School of Milling in St. Gallen. But only a minority could afford to do so.

Bühler has always been committed to knowledge transfer so that it can equip its customers and employees with this resource in the best possible way. Exactly hundred years ago, Bühler founded one of the first vocational schools for its employees, which made it a pioneer in the field of dual vocational training (see page 11). Working with other companies, in 1955 Bühler founded the “Abendtechnikum St. Gallen” institute, which is the predecessor to the “Ingenieurschule St. Gallen” and the technical university that’s there today. Over the decades, Bühler built industrial milling schools around the world for its customers, as well as training centers for the other business units (see graphic p.12). For example, for the special knowledge of Bühler die casting technology to be imparted in detail, the business area Die Casting operates various technology centers (see also p. 14). The opening of the African Milling School in Nairobi is the logical continuation of this success story in which customer focus goes hand in hand with social responsibility and our own business interests.

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this. It was obvious to everyone involved that this method was not sustainable if the milling trade in Africa was to develop further as it should do. This gave rise to the idea of meeting Africa’s growing demand for well trained millers with its very own vocational school. In 2011, the concept was developed and the investment proposal for around CHF 4 million was submitted to the group management. “In my environment, there was a lot of skepticism around this decision back then. But I felt that the time had come to make this step,” says Bühler CEO Calvin Grieder.

And no sooner said than done: The African Milling School is now up and running. Class is now in session for the first 27 pupils – 26 men and one woman, 25-year-old Shidi Huzeinat, who has worked at the Flour Mills of Nigeria in Lagos for four years – who come from nine African countries including Egypt, Nigeria, Mozambique and, of course, Kenya. None of the trainees are newcomers to the industry, they’re all seasoned millers who have already picked up plenty of on-the-job knowledge. Now their companies – which own the world’s largest mills – have sent them on a two-year course to learn the necessary skills from scratch: How do I store grain correctly? How do I best control the milling process? What are the most important quality criteria for flour? How do I measure them? And how do we adapt the processes to them? Knowing this is what makes a good miller. It decides whether a mill runs

Opening of the African Milling School marks just a beginning.

Schools with tradition

1915 Bühler establishes one of the first vocational schools in Uzwil
1955 Bühler, together with Wild, Heerbrugg, and Saurer, Arbon, founds the Abendtechnikum St. Gallen (subsequently Ingenieurschule SG, today FHS St. Gallen)
1957 Establishment of the Swiss School of Milling (with 4 different departments) in St. Gallen
1979 Establishment of the school for feed technology in St. Margrethen
1985 Construction of the training center with school mill in Uzwil

MARTIN SCHLAURI,
MANAGING DIRECTOR AFRICAN MILLING SCHOOL BÜHLER
EAST AFRICA, NAIROBI, KENYA

Martin Schlauri joined Bühler in 1980 after graduating as a milling technologist. After completing assignments in process development and plant commissioning, he was made responsible for the flour milling business in various countries and gained widespread experience in the Italian market as general manager of Bühler’s flour milling department in Milan.

Back to the headquarters in Switzerland, Martin Schlauri took over the management of the grain milling training center offering professional training to milling personnel from all over the world. From 2000 until 2014 Martin Schlauri was heading Bühler’s worldwide grain milling activities. Martin Schlauri is the Managing Director at the African Milling School and takes as well the role as teacher in technology and quality control.

KNOWLEDGE GIVES POWER / Focus
well or badly and whether its owner makes money or loses it. What’s more, a high degree of automation in processes doesn’t replace human knowledge.

For example, the grinding process separates bran from flour. If this process runs badly and the rollers are worn, it reduces the flour yield of the mill. “This can reduce production by up to 2 percent,” explains Martin Schlauri. Every day, a mill can grind up to 1,000 tons of grain; to put it plainly, 2 percent less yield means 20 tons less flour – every day. This corresponds to one fully loaded truck. But not only does the yield fall – at the same time, energy consumption increases by up to 15 percent if the corrugations on the rollers are no longer sharp. This example alone shows how important it is that the production plant is operated by skilled personnel – “which is just one part of the specialist curriculum”, emphasizes the Bühler expert Schlauri. Hygiene and safety are also top priorities on the school’s syllabus.

It’s no wonder that the announcement of the founding of the

“Many of our African customers not only want to buy production plants from us, but qualified personnel too.”

Martin Schlauri

2005
Construction of the training center with school mill in China

2010
Construction and opening of training centers in Johannesburg and Bangalore

2012
Opening of apprenticeship workshops and start of dual system vocational education in Minneapolis and Bangalore

2015
Opening of a milling school in Nairobi
school was met with a great response in the African milling industry, that the small number of spaces were so rapidly booked up, and that the opening was well received by an excited audience over more than hundred guests. Kamaldeep S. Phull – a long-standing Kenyan customer who learned his trade in the Swiss School of Milling in St.Gallen (Switzerland) – stresses: “We urgently need highly qualified specialists in Africa. It’s absolutely fantastic that we can now send our young people to the Bühler school here on the continent.”

And that’s not all: The milling school is fitted with state-of-the-art machines, such as an optical sorting machine, which is still unheard of in most mills in Africa. Peter Kradolfer, Flour Operations Director at Flour Mills of Nigeria, also sees the school as “a milestone for the entire continent”. It’s plain to see that the students are very proud: “We’re the pioneers! It’s a huge honor to be able to be involved,” says Luis Mulanga from Mozambique excitedly, for example.

The milling school is opening at just the right time. The economy in Africa is growing. This is shown by the African Economic Outlook, an economic report published by the Organisation for Co-operation and Development (OECD) in partnership with the African Development Bank (AfDB) and the UN Development Programme (UNDP). According to the report, growth is 5 percent – significantly stronger than the global economy. According to AfDB economic expert Anthony Musonda Simpasa, a few years ago, Africa was thought of as a “hopeless continent”. “Today, Africa is a place with a promising future, a continent full of
hope, and we believe that this economic growth will continue in the coming years.” The sub-Saharan countries are especially booming and experts are predicting a growth rate there of up to 7 percent. This growth and the development of a new middle class mean that the eating habits in the countries are changing. The new consumers demand more variety, convenience foods and pasta. All of this continues to push Africa’s grain industry forward. From 2010 to today, the quantity of processed wheat and corn alone has grown by 6 percent to around 90 million tons a year, and the trend is showing that this growth will increase. It’s clear that this is also increasing the need for state-of-the-art production plants and specialist personnel.

So it’s also clear that the opening of the African Milling School is just the beginning. Even now, applicants are vying for places on next year’s course. What’s more, advanced training courses to train students as head millers are in the pipeline, as well as special short seminars for executive directors: “If executive directors are not familiar with the process from grain to flour and aren’t up to date with current technologies, they often miss out on opportunities and are unable to benefit from market growth,” says Martin Schlauri speaking from experience.

Nobody wants to miss out on opportunities – hit the ground running with the right knowledge to make sure you don’t.

You can get more information about African Milling School: www.africanmillingschool.com

BEST PEOPLE: 100 YEARS DUAL VOCATIONAL EDUCATION AT BÜHLER

Vocational training at Bühler has a high priority and a hundred-year tradition. Every year, Bühler qualifies nearly 600 trainees in Switzerland, Germany, China, the USA and India. “We have already exported the successful model of dual vocational education to many countries,” says Christof Oswald, Head of Human Resources at Bühler. And it is not limited to the company’s own employees, as the new milling school in Kenya demonstrates. Trainees not only get an opportunity to spend part of their apprenticeship abroad, they also benefit from exciting project work and excellent career prospects. Every year, about 80 trainees complete their apprenticeship in one of twelve different vocations. This year, Bühler’s vocational training celebrates its 100-year anniversary. A century ago, Bühler was one of the first Swiss companies to offer vocational education. Since then, more than 7,500 trainees have graduated. About two-thirds start their professional career directly with Bühler and are willing to do it abroad. During their apprenticeship, trainees familiarize themselves with Bühler’s corporate culture, its work processes, products, customers and markets. “By the end of the apprenticeship, they have become highly demanded professionals,” says Andreas Bischof, Head of Vocational Training.

Next to technical qualifications, human qualities are a top priority in the selection of trainees. “Personality is what counts for us. During the apprenticeship, we enter into a partnership with our trainees.

In return for their commitment, we offer them attractive career opportunities and aim at forming them into top-qualified professionals. This opens all doors to a successful future for them, whether with Bühler or outside,” says Andreas Bischof. During the last apprenticeship year, the most committed and talented trainees get an opportunity to spend part of their apprenticeship abroad. In 2015, this dream will come true for 23 trainees. They live and work for several months in America, China, South Africa or European countries. Andreas Bischof: “During their stay abroad, the trainees put their acquired knowledge into practice. It’s an opportunity to get involved with the culture and work habits of their foreign colleagues and to gain both professional and personal experience. Bühler’s unique vocational training concept has already won several international awards.”
Learning – Near and Far

Bühler runs education and training centers for its customers across the world to ensure their knowledge is up to date.

Information on courses:
www.buhlergroup.com/training-courses

USA
- Bühler Food Innovation Center Minneapolis, Minnesota
  - Business Area: Grain Milling
- Bühler Technology Center Holland, Michigan
  - Business Area: Die Casting
- Bühler Training Center Manhhattan, Kansas
  - Business Area: Grain Milling
- Bühler Training Center Raleigh, North Carolina
  - Business Area: Value Nutrition
- Regional Application, Development and Education Center Mahwah, New Jersey
  - Business Area: Grinding & Dispersion
- SORTEX-Training Center Stockton, Stockton
  - Business Area: Sortex & Rice

Germany
- Application Laboratory Cocoa and Nuts Freiberg
  - Business Area: Consumer Foods
- Bühler Training Center Alzenau
  - Business Area: Leybold Optics
- Bühler Training Center Beilngries
  - Business Area: Grain Logistics
- Bühler Training Center Bergneustadt
  - Business Area: Consumer Foods
- Bühler Training Center Viernheim
  - Business Area: Die Casting, Grinding & Dispersion

Information on courses:
www.buhlergroup.com/training-courses
Uzwil, Switzerland

Bakery Innovation Center
Business Area: Grain Milling

Grain Milling Training Center
Business Area: Grain Milling

Grain Technology Center
Business Area: Grain Milling

Innovation Center
Business Area: Consumer Foods, Die Casting, Grinding & Dispersion, Value Nutrition

Rest of the World

African Milling School (AMS)
Nairobi, Kenya
Business Area: Grain Milling

Automation Training Center Joinville
Joinville, Brazil
Business Area: Grain Milling, Feed Milling

Bühler Training Center Johannesburg
Johannesburg, South Africa
Business Area: Grain Milling

SORTEX-Training Center London
London, United Kingdom
Business Area: Sorrox & Rice

Asia

Bühler Application Center Bangalore, India
Business Area: Grain Milling, Die Casting

Bühler Indonesia Application Center
Business Area: Grain Milling, Consumer Foods

Bühler School Mill Wuxi, China
Business Area: Grain Milling

Bühler Technology Center Wuxi, China
Business Area: Grain Milling, Value Nutrition, Die Casting

Bühler Training Center Beijing, China
Business Area: Leybold Optics, Value Nutrition

Bühler Training Center Wuxi, China
Business Area: Grain Milling

Regional Application, Development and Education Center Wuxi, China
Business Area: Grinding & Dispersion

Regional Application, Development and Education Center, Yokohama, Japan
Business Area: Grinding & Dispersion
The requirements in the die casting industry fluctuate in the extreme industrial environment: In just a few milliseconds, the machine builds up to a pressure of up to 1,200 bar and shoots 60 kilograms of aluminum heated to 700 degrees into the die. The process – from the design of the tool dies, to the introduction of the metal, through the cooling and machining of the component – is suitably demanding. “This rough process requires a lot of instinct and experience to ensure consistently high quality with increased efficiency,” says Marius Freitag, Head of the Die Casting Technology Center in Uzwil, Switzerland.

For example, points of failure can result in the component if there is too much air in the die when the aluminum is injected. Worst case scenario: the part is full of holes. Or the liquid aluminum solidifies in a manner that is not completely controlled and this causes solidification cavities to form as it cools. To avoid just that, Bühler developed an extensive range of training courses that cover all aspects of die casting especially for its customers in the automotive industry:

– **Technology**
The principles of metallurgy, fluid mechanics, process optimization and monitoring, or the recognition and correcting of casting defects are paramount.

– **Operation**
How is a Bühler die casting machine built, how does it work, how do I set up the different machine types, do I program these, and do I integrate peripheral devices like robots?

– **Maintenance and servicing**
In this hydraulics and electronics sector, the emphasis of the Bühler machines is on detecting and fixing defects early on – or on not even letting them happen in the first place by using preventative maintenance strategies.

In accordance with the multitude of themes, the range of training programs is aimed at everyone who comes into contact with die casting: operators, fitters, maintenance experts – and even management. As it’s not just about the quality of the parts, but also the efficiency of the processes, and therefore the adjusting screws with which savings are made. One
of the training courses concerns cycle times – the faster the metal can be shot into the die, the shorter the processes, and the faster the return on investment for the machine. This means that the die must be sprayed with a separating agent in between each machine cycle so that the cooling aluminum does not stick to it. This process alone takes around 30 percent of a passage. Optimizing this process is worth the money.

In the meantime, Bühler offers the die casting trainings across the globe. This ranges from courses in quality and process optimization to consulting in casting and factory planning. Against the backdrop of rising electricity and gas prices, energy consulting is also becoming more important. Soon they will also add another Carat machine. The newest training center in Wuxi, China, is available to Europe, the USA and India. The first courses started by the beginning of 2015. Manager and long-standing Bühler service engineer George Li has put together a local team that not only knows the machines, but also the Chinese market. “The first participants are excited,” reports Li. Bühler is now close to the customer, and while operating and maintenance personnel are being trained, production continues. What’s more, Bühler also holds training sessions at its customers’ premises.

All of the training managers are experienced specialists and speak Chinese. The Ecoline, the entry-level die casting machine that is also manufactured in Wuxi, can be used to make samples for new dies, meaning that the first parts can be cast, checked and optimized. Moreover, Bühler also conducts training at customer sites. Courses last for around four and a half days. The training program in Wuxi ranges from courses for quality and process optimization through to courses for foundry consulting and factory planning. In light of increasing electricity and gas prices, energy consulting is also becoming increasingly important.

The Technology Center also has the most important peripheral devices: ladling devices, die casting extractors, or sprayers. Ultimately, it’s not just about die casting, but the preceding and subsequent processes, too. That’s why the Bühler training centers focus on helping the customer to achieve the best and most economical production possible. To do that, you need to know every process across the entire value creation. And at Bühler we do – and we pass this knowledge on to our customers.

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“WeThe newest training center in Wuxi, China, is available to Europe, the USA and India.”
George Li

View into the technology center in Uzwil.
Although we’ve been doing it for thousands of years, processing flour is still always a demanding process. “Grain is a living, organic raw material,” says Dr. Markus Schirmer – Head of the Bakery Innovation Center in Uzwil, Switzerland. As no kernel is the same as another, flour batches are also different from one another. Small bakeries are able to cope with this well because bakers compensate for the differences in the raw material with their experience. But this variability presents great challenges for large companies that require highly automated, standardized solutions.

Back in 2011, Bühler founded the Bakery Innovation Center (BIC) at its headquarter in Uzwil so that it can teach its customers the necessary skills for handling complex tasks of this nature. And it has been a huge success. The range is constantly being expanded and includes courses covering everything from the industrial production of baked goods, laboratory analyses for flour and bread quality, right through to saving costs by optimizing flour quality. In the last year, the BIC training content has been realigned with the aim of understanding flour and baking as one
“With 5 to 10 customers a week, we’re almost always fully booked.”
Markus Schirmer

Given the complex subject matter, it’s no wonder that the Bühler training center is immensely popular. “With five to ten customers a week, we’re almost always fully booked,” says Schirmer. And the knowledge transfer isn’t just running at full capacity in Uzwil; the training centers in South Africa, China and India are also enjoy very good attendance. To increase customer proximity further still, Bühler also offers courses in external schools or company courses.

This not only saves customer travel costs, the presence on the local market also ensures that we understand it and can offer expertise tailored and specific to the region. In Europe, for example, trends are more driven by the customer, whereas in Africa or South America they’re often stipulated by the government. “Ecuador, for example, stipulated that banana meal must be admixed to wheat bread to make it less dependent on imports.” Bühler not only supplies technology for such specifications, but also helps customers to be as productive as possible when using it.

You can find more information about the Bakery Innovation Center at:
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Hygiene is an important subject in the BIC. “Small bakers often get big too quickly,” says Schirmer. The structures in quality assurance, hygiene and traceability fall second to production. These food safety courses are not just designed for experts from the food industry; employees from food agencies also attend.

unit. And that’s because, according to Dr. Markus Schirmer, “good baking means good milling”.

Schirmer, who is a master baker and graduate engineer himself, believes that, above all, the trend toward baking without additives is putting even more focus on the milling process. The qualities of the flour must now do what additives were doing previously in the baking process. For example, the roller contact pressure can modify the starch. As a result, the water absorption of the flour can be influenced, for instance, which in turn affects the freshness of the bread: The more moist the bread, the longer it stays fresh.

In Western Europe, in addition to bread without additives, there’s a trend toward small margins for singles. Small breads do not taste as nice and have shorter shelf lives. Sponge dough and sourdough can provide relief here. They contain more water, form natural flavors and maintain freshness. The problem is that quality fluctuates, and these variations can only be prevented using precise analyses, sufficient specialist knowledge or automated processes.

Hygiene is an important subject in the BIC. “Small bakers often get big too quickly,” says Schirmer. The structures in quality assurance, hygiene and traceability fall second to production. These food safety courses are not just designed for experts from the food industry; employees from food agencies also attend.
“When there is something I don’t know or understand, I’m overcome by an incredible energy and an insatiable thirst for knowledge,” Peter Böhni says, and that’s what drives him forward in his daily work. Educated at renowned institutions such as the University of California, Berkeley, Böhni has now been with Bühler for nine years. A communicative problem solver, he is not only a preeminent researcher but also has comprehensive experience in the development of sustainable business models in the food industry. His leadership has made it possible for Bühler to develop a number of new processes and technologies, bring them to industrial maturity and market them with success – such as the extraction of Leuron from the aleurone cells of wheat or the production of rice enriched with micronutrients.

In search of marketable solutions
A quarter century after leaving academia, Böhni is now returning to it. As director of Bühler’s innovation satellite at EPFL in Lausanne, he will be in a key position because cooperation with leading academic partners is a cornerstone of the group’s “open innovation” approach. In his new job, Böhni sets out to spot promising research projects and start-up enterprises in the orbit of the university. “Every project Bühler invests in at EPFL must either be successfully implementable in the market within a few years or help our group capture the leading edge in a new technology,” he says of the ambitious goals of the collaboration. In contrast to fundamental research, the focus is on the development of marketable solutions.
Promising projects identified

Just a few weeks into the job, Böhni has already established new contacts and identified promising research projects. As an example, he mentions the visualization of microscopically small organisms such as bacteria or fungi using new biochemical technologies. “If such technologies could make it possible to uncover contaminations in a food production line, the plant could be cleaned much more systematically and efficiently, and this would improve food safety,” Böhni predicts.

For Böhni the team player, this cooperation bears a huge potential to cope successfully with the challenges of the future. And they are massive: From 2010 to 2060, a growing world population will require a quantity of food that amounts to the total global consumption between 1500 and 2010. The industrial implementation of the technologies developed at EPFL can make a contribution to this task. “The future belongs to open innovation processes,” Böhni says with conviction. As Bühler’s man in Lausanne, he will do everything to link the right players with each other.
Innovations – A Give and Take

Since 2004, Dominique Foray has been Professor of Economics and Management of Innovation at EPFL in Lausanne. diagram talked with him about knowledge management and innovation in companies.

INTERVIEW WITH PROF. DOMINIQUE FORAY

Prof. Dominique Foray investigates how knowledge is generated and distributed.
I rather see myself as creative; I put that you have created? Innovation. But they often lack the stay-

Small and very large businesses are innovative in different ways. The small ones are flexible, less dogmatic, less bureaucratic, and often highly motivated. These are good conditions for innovation. But they often lack the stay-
ing power to deal with possible failures. That's a risk you always run with innovations. Large businesses are much better at this. Above all, they are in a better position to establish an innovation in the market. There are good models showing how small and large businesses can effectively cooperate with regard to innovations.

How do you define innovation anyway? Do you adhere to the classical Schumpeter theory? Innovation means, first, to have a new idea, and secondly, to flesh it out, i.e. to make it implementable. As regards innovations in the industrial domain, I follow the Schumpeter theory, which says that an innovation deserves its name only if it's successful on the market. On the other hand, there are social innovations, for example the so-called orphan drugs. In this case, the pharma industry develops drugs against very rare diseases for which there is no adequate market. This can be organized via private-public partnerships, for example.

How can businesses systematically utilize and manage their knowledge? Knowledge management should not be seen as an isolated discipline. Knowledge arises from cooperation between different fields of expertise. IT and telecommunications play a particularly important role in this process. Knowledge management is more effective when differential knowledge is better integrated in practical cooperation.

What are the major obstacles and, on the other hand, the major catalysts for knowledge management? When businesses attempt to implement knowledge management in an isolated way, this cannot work because there is no holistic approach. It has to be connected to the company’s practical day-to-day activity. A very effective catalyst is the IT strategy of a business, which virtually forces the implementation of knowledge management.

Diagram: Your field of expertise is innovation. What recent innovation has surprised or delighted you?

Dominique Foray: Wikipedia. I mean this as a metaphor for all new models to collect the world's knowledge and make it freely available to everybody. Every user contributes to creating the content and checking the quality. Just in passing, Wikipedia has destroyed a business model. Encyclopedias are hardly profitable anymore. With Wikipedia, they have become a social institution. And a democratic one at that. Every user decides what knowledge is incorporated into the encyclopedia and in what form it is communicated.

What is the most innovative thing you have created?
I rather see myself as creative; I put that into action in my private life. It’s what we call “common innovation”.

What is your recommendation for businesses with regard to innovation?
Businesses should position themselves in a lively environment. They should be part of the community that surrounds them. Thus they should network with universities, research institutions and associations and cultivate these relationships. Knowledge is in the air, so to speak. They should especially think about what they can do for the people and institutions in their environment. They should be clear about what collective goods they are able to offer, i.e. services to the community. That’s a mutual give and take. Many international corporations in Switzerland refuse to act in this way. That’s a bad thing.

In your view, do small or very large businesses have better chances to be innovative?
Small and very large businesses are innovative in different ways. The small ones are flexible, less dogmatic, less bureaucratic, and often highly motivated. These are good conditions for innovation. But they often lack the stay-

What general advice can you give to businesses wishing to utilize their knowledge for successful innovations?
Create networks, be open-minded and share your knowledge. Many businesses are still unaccustomed to this, but it will become an increasingly important success factor. The keyword is “open innovation”. Those who don’t take part in it will sooner or later be left behind.

“Businesses should position themselves in a lively environment.”

Prof. Dr. Dominique Foray
Dominique Foray earned his doctoral degree (1984) and post-doctoral qualification (1992) at the Université Lumière Lyon. In 1990 he became professor of economics at the Ecole Centrale Paris, and in 1994 he moved to the French research center CNRS. Later he was appointed as guest professor at various international universities.

From 1993 to 1995 he worked as a permanent consultant (part-time) for the OECD (Directorate of Science, Technology and Innovation), where he supervised the “National Innovation Systems” program. Prof. Foray is also the only foreign member of the Commission of Experts for Research and Innovation, an advisory body to the German government. Foray’s research interests include the economics of science and technology, the economics of knowledge production and distribution, and the analysis of economic change processes.
BÜHLER TECHNOLOGIES

Rock Around the Clock

Leybold Optics
Thin film coatings for mobile devices

Grinding & Dispersion
Color pigments for lipsticks

Consumer Foods
Coffee

06:30

07:15

10:00

06:30

07:00

07:30

07:00

Grain Milling
Bread and cereals

Value Nutrition
Feed for pets, fish and livestock
Every day, billions of people use Bühler technologies to satisfy their basic needs for food, mobility or communication. With our industrial process technologies and solutions, we make a significant contribution to feeding the world’s population, while focusing on food safety and security. Around 65 percent of the wheat harvested worldwide is processed into flour on Bühler mills. The company’s contribution to the global production and processing of rice, pasta, chocolate and breakfast cereals is similarly substantial. Furthermore, Bühler is a leading solution provider of die casting, wet grinding and surface coating technologies, with a focus on applications in the automotive, optics, electronics, printing, packaging and glass technologies.
Creating an Aha! Effect

Guests from overseas who visit Bühler in Uzwil can prepare themselves for a real eye-opening experience. When you get to the airport, you're greeted by a chauffeur in a limousine who hands you a welcome note from CEO Advanced Materials Samuel Schär, which reads: “We want to take you on a trip into the future.” Visitors might think, “Well, anyone can say that”. Then they read that many of the parts in the electric limousine that they’re sitting in were built using Bühler machines and that Bühler is a leading innovator when it comes to the production of lithium-ion batteries. “Interesting,” the passengers could say. E-Mobility cannot be introduced on a large scale because more efficient batteries are still unavailable. Schär concludes by explaining that he’s going to tell the visitors a secret. He says that Bühler has successfully modified the equipment used in the production of breakfast cereals and snacks to manufacture materials for the next generation of lithium-ion batteries. Breakfast cereals give us energy: that’s no revelation. But electric cars? “Wow! Who would’ve thought of such a thing?” comment some guests. Surprising ideas give rise to innovations that change the world for the better.

The secret in manufacturing high-performance lithium-ion batteries lies in the preparation of the electrodes. Thanks to its experience in the processing of nanoparticles, Bühler can transform the electrode materials in a way that enhances battery performance. In addition, Bühler offers comprehensive solutions for the manufacture of lithium-ion anodes, cathodes and separator slurries, including procurement of raw materials.

Did you know that numerous parts of this e-car are produced on Bühler machines?

**ELECTRONIC MATERIALS**
- li-ion battery masses

**AUTOMOTIVE COATINGS**
- primer
- base coat
- clear coat
- anticorrosion

**DIE CASTING ELEMENTS**
- gear box
- shock tower

**BRILLIANT COLOR FILTER**
- navigation device

**THIN-FILM COATINGS**
- back/head light reflection
- decor interior parts
- head-up display
**COFFEE ROASTING IN INDIA**

**No Cold Coffee**

Since the end of last year, the traditional Indian roasting house Cotha Associates from Bangalore has been the first customer to introduce Bühler’s new coffee roasting technology “InfinityRoast”. InfinityRoast automatically replicates the master roasting profile precisely, batch for batch, for traditional roasting profiles, as well as for innovative non-standard profiles, all the while guaranteeing the greatest possible quality consistency. The people in charge at Cotha are so excited about this innovative technology that they’re making it the subject of their own company PR campaign and are attracting a great deal of interest as a result. Alongside the president of the Indian Coffee Board, more than 70 invited guests from the Indian coffee industry also attended the inauguration ceremony that featured a live demonstration of the roaster. India is becoming an increasingly important market for coffee even though it’s traditionally more associated with tea. India currently only produces around 4 percent of the green coffee consumed around the world but is continuously growing more coffee – both for its own consumption and for export. This is mainly because Indians are drinking coffee instead of tea more and more frequently.

India currently produces about 4 percent of the world’s green coffee consumption.

**RENAMEING**

**Leybold Optics Becomes Bühler Alzenau**

Since the beginning of 2015, the company that was previously Leybold Optics GmbH from Alzenau has been trading under the name Bühler Alzenau GmbH. Bühler took over the specialist and market leader for optical vacuum coating technology in May 2012. Bühler intended to use this strategic acquisition to expand its competencies in the production of functional coats in its Advanced Materials division, and specialists are expecting enormous growth here. Leybold Optics has developed solutions that are in demand all over the world in sectors such as the precision and spectacle optics, automotive, architectural glass, flexible electronics, as well as the food packaging industries. The name Leybold Optics is steeped in tradition and will continue to live on: it can still be found in the designations of the business area, as well as in the machines and products.
BÜHLER AND MASSCHALLENGE PROMOTE START-UP

Start-up Support for Young Entrepreneurs

“We are convinced that MassChallenge will provide elements such as entrepreneurial spirit, selectivity and a sense of urgency and fuel further growth in Swiss start-ups,” comments Ian Roberts, Bühler CTO. “The collaboration of MassChallenge with Bühler is emblematic of the strong cooperation between the USA and Switzerland in the domain of innovation,” said Suzan G. LeVine, US ambassador to Switzerland and Liechtenstein.

MassChallenge is supported by investors from companies or public institutions and offers advice and assistance to promising start-ups from every sector. To date, the more than 600 companies that have been funded by MassChallenge have raised over USD 706 million in funding, generated USD 404 million in revenue, and created 4,800 jobs.

For a few years, Bühler has been developing its professional innovation management with an emphasis on collaborative innovation. That’s why the company has partnerships with universities all over the world and drives shared designs and developments with its employees, customers and suppliers. MassChallenge has given Bühler the opportunity to work even more closely with these start-ups. “Bühler’s excellent combination of global leadership, solid performance and outstanding innovation will undoubtedly strengthen our global network,” says MassChallenge Founder and CEO John Harthorne.

Bühler and the non-profit organization MassChallenge from Boston will be working together in the future as part of the MassChallenge International Bridge accelerator program. The partners intend to support promising start-up companies from Switzerland with funding and expertise.

Bühler CTO Ian Roberts with Susan G. LeVine, US ambassador to Switzerland and Liechtenstein.

LARGE-SCALE ORDER FROM BANGLADESH

Bühler Virtues Are the Key

In Bangladesh, one of the main challenges is making sure that everyone has enough safe food to eat. The country is home to around 158 million people, around half as many as in the entire USA. In the near future, Bühler will be making more contributions than ever toward providing the local food industry with the necessary equipment for meeting this demand. In addition to a large-scale plant for rice, lentils and grain storage, in the last five years Bühler has purchased five wheat mills and a grain handling terminal to Bangladesh for the local food company City Group from Dhaka. The team responsible is particularly proud to have stopped the Turkish competition that had been successfully expanding across the Asian market for years. In the last year, they’ve not won a single contract over Bühler. Thanks to its virtues of precision, quality and dependability, Bühler had impressed the boss at City Group, Fazlur Rahman, for example, who explains: “I chose Bühler because I didn’t want a headache while implementing the project.”

With this plant, City Group will produce 72 tons of rice, 25 tons of atta flour and 8.5 tons of red lentils per hour.
New Bühler Facility in Morocco

In late March, Bühler inaugurated its new service station in Casablanca, Morocco. Besides specialists for service and commissioning, roll refluting, it offers local spare and wear parts and customer training. In line with the Bühler strategy “in the markets for the markets”, the Casablanca location is also responsible for the North and West Africa sub-region in supporting with quotations and fulfilment for standard solutions. Bühler has over eighty service stations worldwide; twelve new stations have been opened in 2014 only. In late April, another service station will be inaugurated in Pakistan. More to come.

Smart Minds for New Ideas

In order to introduce additional skills, perspectives and experiences into the innovation activities Bühler has formed an Innovation Advisory Board. Its members include internationally respected leaders – with innovation and specialist know-how – who will help Bühler optimize processes, adopt latest technologies, and accelerate development of new products and services. The board manages the Urs Bühler Innovation Fund and meets four times per year at different locations in the Bühler world. The Advisory Board is formed by Urs Bühler plus Hal Gurley, Matthias Kaiserswerth and Ed Steinfeld.

Hal Gurley has held leading positions at Cisco for ten years, now serving as managing director of Cisco Switzerland and global responsible for Cisco Cloud / Network Systems. In the early eighties, he had set up Automation Intelligence, a specialized software business that he sold in 1993. After this, he acted as CTO for SIG and was in charge of Internet/IP at Swisscom. Gurley holds a degree in electrical engineering from the Georgia Institute of Technology and obtained his Executive MBA from the IMD in Lausanne.

Matthias Kaiserswerth is the director of the world renowned IBM Research Centre near Zürich. Before this, he headed software and security research at IBM TJ Watson Research Centre, where IBM teams up with customers to develop joint solutions for the future. Kaiserswerth holds a Master's degree in Computer Science from the McGill University in Montreal and obtained his PhD from the Friedrich-Alexander-Universität in Erlangen, which since then has appointed him as honorary professor.

Ed Steinfeld is a specialist in the field of China studies, professor in the Department of Political Science, and director of the China Initiative at Brown University in Providence, United States. Before this, he was employed at the MIT in the Political Science department. Steinfeld has lived for many years in China and has written various publications and books on subjects such as innovation, technology, and changes in the world of engineering. Steinfeld obtained his Bachelor’s, Master’s and PhD degrees in Harvard.
Beijing’s Blue Skies

The continuing urbanization of China places a huge responsibility on the construction industry to contribute towards more energy-efficient buildings. Jinjing’s low-e glass improves insulation on a significant scale.

BY JUSTUS KRÜGER (TEXT) AND RAFFAEL WALDNER (PHOTOS)
This looks odd: Yizhuang, a suburb of Beijing, is normally swarming with workers, office staff and trucks. Located about 45 minutes’ drive southeast away from the city center, Yizhuang is an industrial zone. Today, however, early in November 2014, the area is quiet, nearly empty. Production is standing still. There is hardly a car on the road. The reason: Factories in Beijing and neighboring areas were temporarily closed to reduce the notorious smog over the Chinese capital for a few days.

It worked. But while the citizens of Beijing enjoyed the blue sky, more long-term measures are needed to make China’s economic success more ecologically sustainable. Naturally, the government as well as private companies are aware of this. One of the companies that make a difference is the glass producer Jinjing.

The factory in Yizhuang, so quiet in early November, is otherwise one of the company’s main production sites. The centerpiece of the facility is a large, state-of-the-art glass coating system – which goes by the promising name of LEYBOLD OPTICS GLC series H (formerly Apollon) – by Leybold Optics, which belongs to the Bühler Group.

In its entirety, the installation with the Leybold machine at its core is well over 100 meters long and has a whole factory hall dedicated solely to housing it. “We are putting out millions of square meters of low-e glass every year in this one factory in Beijing alone,” says Xu Jun.

**Saving the energy of entire power plants**

Xu Jun, technology manager for engineering glass at the company, is one of the few people in the Jinjing factory in Beijing’s suburb during the anti-smog holiday. “Normally, there are about sixty people in this facility,” he says. “Now, we are using the days off to do maintenance work.”

Saving the energy of entire power plants

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“In order to insulate the glass, invisibly thin layers of silver are applied onto the panels. This is done atom layer by atom layer.”

Xu Jun

Masters of Coated Glass

Jinjing Group was founded in 1904. It is headquartered in Boshan, Shandong Province in Eastern China. Jinjing’s production facilities in Beijing went into operation in 2013. 10 million square meters: annual capacity of the glass coating system at Jinjing, Beijing. 33 million weight cases of float glass: annual output of Jinjing Group. This amounts to approximately 10 percent of the total national output in China.

Famous buildings with glass contribution by Jinjing:


“Bird’s Nest” stadium, the main venue during the Olympic Games 2008.

China Pavilion during the Expo 2010 in Shanghai.

Burj Khalifa Tower in United Arab Emirates.

“Low-e” stands for “low thermal emissivity” – referring to the insulating capacity of glass. The lower the “emissivity” the better the windows made of such glass insulate against heat loss. The annual energy savings achieved with the low-e glass produced by Jinjing’s one Leybold machine alone make a real difference: They amount to a significant share of the yearly energy production of an entire nuclear power plant.

“It is difficult to quantify this with more precision,” says Xu. The reason is that there are many factors determining the “emissivity” of a building, not just the quality of the glass. What is the ratio of window surface to building surface? What construction material are the walls made of? “All this plays a role too,” says Xu. “It is clear, though, that low-e glass really changes the energy efficiency for the better on a very significant scale.”

New cities for hundreds of millions

This holds true especially in China. Real estate, and therefore construction, is a very significant factor for the Chinese economy at large, and is virtually certain to remain so. This is because urbanization is one of the megatrends that will continue to define China in the coming decades. In addition to the growth of existing cities, the Chinese government projected last year to build new cities from scratch to provide housing for approximately 120 million rural migrants – all within the next twelve years.

The urbanization of China has meant good business for Jinjing. “We saw growth rates of up to 80 percent a year,” says Dr. Ji Yalin, deputy general manager at Jinjing Group in Beijing. “Now it has slowed down.” In this context, the word “slow” can have a surprising meaning, though. “Our more recent growth was at 20 percent annually,” he adds. Due to the sheer scale of urban construction in China, the growth of cities is not only economically important. It is also one of the most significant factors for ecological sustainability in the country. Coated glass plays a key role in making buildings, and by consequence cities, more energy-efficient. And this is an area in which Jinjing is a step ahead of its competition.
In order to manufacture low-e glass out of regular float glass, invisibly thin layers of silver are applied onto the glass panels until the coating reaches a thickness of about 8 to 10 nanometers. “This is done atom layer by atom layer,” explains Xu. The decisive quality of silver in this context consists in functioning as a mirror for infrared wavelengths. “The thin silver layer allows most of the visible light to go through,” says Xu, “while blocking invisible thermal radiation.” That way, warmth stays inside the buildings, where it belongs, while the coating makes no significant difference with regards to light transmission – as long as it is thin enough. The most common form of this type of glass to date is so-called “single low-e”, which means that it is coated with one layer of silver coating. It is possible, however, to sharply increase the insulating capacity of the glass by adding two or three layers – double and triple low-e.

**Without competition**

The coating, whether single, double or triple, can pose a challenge, however, for the manufacturers who process the glass, whether to increase its durability or simply to cut it to size before it is installed in the buildings in questions. Conventionally, the coating can only be applied after processing the glass in this manner. This can turn into a real problem. “You can have terrible delays at construction sites simply because a few windows broke,” says Xu, the engineer in the empty factory. “The building firm needs to contact their suppliers, and they in turn need to go back to the company that made the glass in order to get exactly the right-sized windows from them. So everything has to be made from scratch, just to replace a broken window. This can take weeks, in extreme cases even months.” For Jinjing’s customers, this problem does not exist.
Thermal protection layers on architectural glass help to save energy and protect natural resources. Bühler Leybold Optics is a world leader in thin-film technology and specializes in the development and manufacture of large-area coating systems. The LEYBOLD OPTICS GLC series H is a high-vacuum sputter coating system specifically designed for the needs of architectural glass coating. The sputter process involves ejecting an ionized target material from a source onto a substrate such as architectural glass. With its unique design, the LEYBOLD OPTICS GLC series H is ideally suited for challenging thin-film layer stacks and flexible product mixes. Typical coatings include solar control, anti-reflection as well as single, double and triple low emissivity (low-e).

The machine is available for substrate widths of 2,590 mm and 3,300 mm and can be configured to specific production needs. Its innovative technologies make it a highly productive and cost-effective machine. The gap between two consecutive substrates, for instance, has a major impact on the efficient usage of the target material and hence the cost of ownership. Thanks to the advanced gap management, the distance between two succeeding substrates can be reduced to 30 mm. This lowers the amount of wasted target material considerably in comparison to conventional solutions with a 100 mm gap.

Vacuum chambers are needed to apply the silver coating. Its thickness reaches 8 to 10 nanometers, or about 80 layers of atoms.
The Leybold glass coater that it operates is capable of producing so-called “temperable” low-e glass, whether single, double or triple. This means that to enhance their mechanical properties, the glass panels can be thermally treated even after the coating process without damaging the coating itself. “This sounds highly technical, but it is a huge advantage,” says Xu. “This way, our clients can process the coated glass panels any way they need. One implication is that they can replace breakage quickly and without any fuss.” This gives Jinjing an edge over the competition. “There are many firms in China who can do this with regards to single low-e glass,” says Xu. “And there are just a few that can do it with double low-e. But there is nobody who can do this with triple low-e. We are the only one.”

This was decisive for Jinjing’s decision to invest in a Leybold glass coater. “This was an important factor for us,” says Dr. Ji. “So far, we have no competition in this field.”

Rising standards
This is all the more important because it is a virtual certainty that efficiency standards for buildings in China will continue to rise. “So far, single low-e is the most common form of low-e glass in China,” says Dr. Ji. “This will certainly change.” As a consequence, Jinjing’s advantage will increase – until, that is, other companies acquire the same capabilities. This would certainly be good news. It would contribute to reducing the overall energy consumption – and it would help to make the sky a little bluer.

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Clean Nuts

The automatic separation of nutshells used to be a difficult process. But now, with BioVision, Bühler has now developed a new recognition technology that makes it possible to offer integral solutions for nut sorting.
Nuts not only taste good, they’re healthy as well. Thanks to their high content in polyunsaturated fatty acids, they reportedly lower blood cholesterol, stabilize sugar values, and in some cases even reduce the risk of heart disease. No wonder more and more people include them in their diet. “From walnuts through hazelnuts to almonds, all varieties have one thing in common: only the kernel inside the hard shell is edible. That’s why shells and shell fragments must be removed completely after cracking,” explains Charith Gunawardena, Head of Business Unit Optical Sorting at Bühler. The reliable elimination of shells is especially important if the nuts are processed for snacks or confectionery, because shell residues can pose a considerable health risk to the consumer.

When it comes to cleaning large quantities of raw products such as tree nuts or peanuts, optical sorting machines have proven to be particularly efficient (see box p. 36). These machines make it possible to target and remove undesirable fragments with pinpoint accuracy. Moreover, specimens that are contaminated or defective in shape or color can be sorted out with ease. With optical sorting machines, manufacturers can meet the most stringent food safety regulations and satisfy the increasing hygiene demands of consumers.

**Sorting out shells is a challenge**

In practice, sorting out the shells of almonds is an especially difficult task. “That’s because there are dozens of almond varieties that differ in color. As a result, when you work with conventional sorting systems, the machine settings have to be changed every time you switch to another product,” Gunawardena describes the problem. Major manufacturers have therefore been hoping for a solution allowing various almond varieties to be processed in a single cycle, without requiring a change of settings.

**BioVision exploits differences in the spectral signature**

For Bühler, this customer requirement was the stimulus to develop a fundamentally new recognition system for sorting out almond shells. The first step was to carry out comprehensive analyses of the spectrum of nuts and shells. During these analyses, the engineers found out that the kernels and shells of almonds are characterized by different spectral signatures. This means that they differ slightly in their specific reflection behavior. Such differences
were observed in all almond varieties. “The BioVision recognition technology systematically exploits these spectral characteristics, and as a result, sorting becomes much more efficient compared to conventional systems,” Gunawardena explains. Because the optical process is so effective, even extremely small shell fragments can be identified and removed. And since such spectral differences occur not only in almonds but also in other edible nuts such as hazelnuts or walnuts, it is envisaged to use the BioVision technology for separating the shells of other varieties, too.

The optimal solution for every manufacturer
In preliminary tests, the new process has already proven its superior performance in an impressive way: it was able to sort up to ten varieties of almonds simultaneously without any need to change the system settings. The innovative technology will soon be launched in the new SORTEX E BioVision machine. Equipped in this way, the machine can then be placed in the processing chain directly after the cracking stage. But BioVision can also be used in combination with other recognition techniques, for example if foreign bodies or damaged fruits need to be sorted out additionally. “Bühler is capable of adapting the new technology to the processes of both small and large manufacturers. As a result, it can offer individualized sorting solutions that are optimally adjusted to the customer’s application,” Gunawardena emphasizes.

Optical Sorting: Accurate and Efficient
The processing of raw products such as coffee, grains or legumes involves extremely large quantities. No matter how carefully the crop is handled, some foreign bodies such as stones or glass inevitably get into the product and have to be carefully sorted out. Individual items of produce that are defective in shape or color also need to be eliminated in order to meet the specific quality requirements of the manufacturers and to ensure the safety of all food products. Manual elimination by humans is not only effortful and expensive, it is above all prone to error. That’s why automatic optical sorting via cameras or lasers was introduced into foodstuff processing. Depending on the sensors and image recognition software used by such systems, they can distinguish the color, size, shape, structure or chemical composition of their targets. Color cameras, for example, can detect minimal color differences, and indium-gallium-arsenide (InGaAs) cameras can identify defects that are of similar color to the product but have a different optical signature. Modern sorting systems screen every single object within fractions of a second on the basis of user-defined accept-or-reject criteria. Defective products or foreign bodies are removed with pinpoint accuracy by air jets. Even at high throughputs, this ensures the consistent quality of the end product and minimal error rates. Since 1947, Bühler Sortex has been the leader in the field of intelligent optical sorting technologies. Currently, over 25,000 Bühler machines are in operation worldwide.
Culinary highlights have never been expected in space. That could be changing. Instead of eating out of a tube, the astronauts of tomorrow will be eating complete meals. This is all being made possible by a NASA research project with a 3D printer. The printer is supposed to make ready-to-serve powdered food ingredients according to a recipe loaded from the computer. The English research company Dovetailed has recently added to this with an earthly version by introducing the first 3D fruit printer. The new printing technology means that not only can we create real fruits, but new ones too: we can redefine taste, texture, size and shape.

Even if it’s not everyone’s cup of tea, news like that certainly grabs your attention. What was previously a subject for medical technology or the automotive industry, has now reached the food industry. And it’s done so in two ways: On the one hand because additive manufacturing (AM) has the potential to revolutionize the industry with previously unknown foods or new methods; on the other hand because it signals new starting points for making established production processes more efficient and more flexible. The experts at Bühler are convinced: “3D printing has a massive impact on the way in which we will do business and work with our suppliers and
customers in the future,” says Chief Technical Officer (CTO) Ian Roberts, for example. In Uzwil, the first 3D printer was purchased two years ago. Since purchasing the printer, three-dimensional objects that were previously very time-consuming to produce have been being printed out literally overnight.

Spare parts from the printer
The principle is simple: Special plastics are applied layer by layer, quickly harden, and form the basis for the next layer. And that’s how a three-dimensional object that was previously only available as a 3D CAD model “grows” bit by bit. The technology has already proven to be valuable for developing prototypes. Additive manufacturing has made the development process quicker and cheaper.

And the procedure is now going to the next level: 3D printers are getting increasingly faster, smaller and more efficient; specialists from Siemens predict that in the next five years the manufacturing costs for additive manufacturing will halve and production speeds will quadruple. And more and more materials are being tried out – in particular metals as well as plastics. This is also of interest to Holger Feldhege, Head of Production at Bühler: “The technology offers a unique opportunity to create solutions that have previously been impossible to realize using conventional manufacturing procedures,” says the head of the Manufacturing & Logistics division. According to Feldhege, parts that were previously assembled from thousands of single parts and that needed to be quality-
checked at every intermediate stage can now be manufactured as a single piece. And this year the first parts are to be installed in serial production. Patrik Högger, Head of the Development and Service Center, hopes that we could be ordering spare parts via the printer in just a few years.

**Leap forward in production quality**
Mirko Meboldt, professor of Product Development and Construction at the Swiss Federal Institute of Technology (ETH) in Zurich, Switzerland, predicts that flow-optimized geometries without corners and edges will actually make for a real advance in terms of quality in production. Only very small amounts of dough, pasta or chocolate get caught in the nozzles and pipes. Meboldt believes that if this new technology allows just 10 percent to be saved, it’s revolutionary. What’s more, it means that devices can be cleaned better. And that saves both time and money.

One of the greatest production benefits could be temperature control, which has a particularly significant impact in the food industry. This new technology means that cooling channels, which locally dissipate heat directly, can be built directly into nozzles.

Shorter development times, lower production costs, and better quality – the potential is enormous. However, according to CTO Ian Roberts, they know that other people are working with this technology. “That’s why we’re open to discussions, co-operation and partnerships.” Bühler is already working with ETH in Zurich. An internal competition was held to gather ideas for practical applications which were collected across the group. Around ten of the proposals are so promising that they are to be pursued. “Bühler are pioneers; they always have good ideas,” says Meboldt.

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**ADDED VALUE**

- High integration of functions in one component
- High geometric flexibility of components
- Low consumption of materials
- Faster product development
- Decentralized production
Since 2011, when the books “Wheat Belly” and “Grain Brain” appeared in the USA, the trend toward gluten-free diets has skyrocketed. According to a 2013 study by Mintel, the market for gluten-free products grew by 44 percent between 2011 and 2013, reaching a volume of USD 10.5 billion. This is certainly welcomed by the estimated 1 to 2 percent of the world population who suffer from gluten intolerance (celiac disease). These people benefit from the additional gluten-free products that continuously appear on the market. For all others, health benefits of gluten avoidance is an animated discussion. Available data on the relationship between gluten consumption and gastrointestinal conditions are inconsistent, while research into the effects of gluten consumption on widespread diseases such as obesity, diabetes and cardiovascular disorders is still in its infancy. Several theories for the explanation of gluten sensitivity observed by consumers coexist. One theory says that patients reporting reactions to gluten suffer from a temporary impairment of the gastrointestinal system. This may be triggered by factors like unbalanced diets or antibiotic treatments. Both can affect the balance of the gastrointestinal flora. Recent studies suggest a link between the composition of the human gut microbiota and some widespread diseases like obesity and diabetes. The role of grain
constituents like digestible and non-digestible fibers but also gluten has not yet been conclusively established. “Separating the effects of gluten and other grain components is a scientific challenge. While the knowledge basis on the effect of single wheat components is not yet sufficient, the positive long-term effect of whole grain consumption has long since been established in large-scale scientific studies”, says Dr. Nadina Müller, Nutrition Program manager at Bühler. “Bühler’s aim is to understand the underlying causes of reported gluten sensitivity as a basis to develop processes for the manufacture of new products. Products in which wheat constituents are modified such that gastrointestinal distress is nil and an additional contribution to the consumer’s well-being induced.” To achieve this long-term objective, Bühler is currently establishing cooperations with renowned research institutes.

Storage, cleaning, grinding
Companies producing gluten-free food need to control and certify the entire supply chain from crop to shop. Gluten-free products can be stored, cleaned and processed using proven Bühler solutions. The consistent separation of gluten-containing and gluten-free raw materials during transport, storage and processing is key to avoid cross-contamination.

For seeds to be certified as gluten-free, the maximum value is, generally, around 1 percent. A small percentage of cross-contamination will always remain despite precautions. Bühler has launched the new SORTEX A series in late 2014 designed to remove the small percentage of the crop that remains contaminated despite precautions. In addition to the proven SORTEX technologies, the SORTEX A optical sorter can be configured with a color vision system and powerful InGaAs technology which allows sorting of gluten-containing grains by color, shape and size. The SORTEX A series can be integrated into an existing Bühler cleaning line and can, depending on raw material quality, reduce the gluten content to less than 1 percent.

Trend product quinoa
Quinoa is currently experiencing a particularly strong trend, as a health food or ingredient in flour for pasta, or in breakfast cereals. These millet-like grains originating from the Andes are regarded as very healthy due to their high content of protein and minerals, especially magnesium and iron. Since the hull of quinoa contains a bitter-tasting compound that protects the plant against insects, the grains need to be pretreated. Traditionally, the Peruvians wash the quinoa fruits in large cloth bags in the river. For industrial processing, Bühler offers a vertical grinding machine enabling the peeling of the hulls in a dry process. Additionally, Bühler offers secondary processing like hot extrusion to manufacture breakfast cereals. Here, too, recipes can contain quinoa or any other gluten-free raw...
To avoid gluten, many people cut wheat out of their diet. Professor Fred Brouns thinks this doesn’t make sense in most cases.

Fred Brouns: In America we see that more than 40 percent of the people ask for gluten-free products. In Australia it is about 15 percent. In Europe we observe an increasing number of avoiders but real data are lacking. Preliminary data from NL indicate about 15 percent. However, only 0.7 to max. 2 percent of the world population has celiac disease, and another 2 percent are tested positive in a gluten allergy skin prick test. Preliminary studies suggest that about 30 percent of individuals with irritable bowel complaints react positively on avoiding wheat. This represents another 5 percent of the population. Thus, overall, 8–9 percent of the population shows benefits from a wheat-gluten-free diet, much less than the total number of avoiders. When you ask the remaining group why they do not eat gluten, more than half of them say that they had heard that avoiding wheat is more healthy. Very often they refer to advice of a family member, television or internet information. There are no data to support that individuals who do not suffer from a medical condition (celiac disease, allergy) should avoid wheat or gluten. Yet, if so many people say that they feel better we should understand why? Is it a real effect, or is it merely related to expectations – psychological factors?

Do those who avoid gluten for non-medical reasons know what gluten is?

No, in general most consumers have no idea about what gluten is. But, if a lot of people in your surrounding say “this is bad for you” then you start to believe that. This is a nocebo effect (the opposite of placebo effect). If everybody says that eating something isn’t good for you then you automatically feel better when you make the effort to stop eating that.

Is a scientific reason known for wheat-gluten sensitivity while not having celiac disease?

We don’t know yet, the cause is not understood at all, and there is no diagnostic tool for this condition. Therefore, under Health Grain Forum Europe, we are now planning well controlled studies to unravel this.

So do you think that people will go back to eating wheat?

There is no evidence to support that the general population should not consume wheat. A recent very large study (>100,000 people) on the effect of whole grain consumption (of which the majority is wheat!) on health, showed significantly better conditions of the heart, less diabetes and less colon cancer. We do not see that wheat consumption leads to over-weight and diabetes. Whole wheat and other whole grains are a significant source of fibers and minerals such as magnesium and zinc, thus an important part of the daily diet.

I would predict that the population effect of feeling better being on a gluten-free diet, in those individuals who avoid for nocebo effects, will disappears in two to three years similar to other diet hypes in the past like Atkins and Montignac diet. I expect that wheat-gluten-free will go down to 10 or 12 percent of the overall population in the near future.

The current hype nevertheless brings also something good! It leads to an enormous pressure on the food industry to make tasty gluten-free products! For those who really need a gluten-free diet lifelong this is a very welcome development.

PROF DR. FRED BROUNS

Fred Brouns obtained a PhD in Nutritional Physiology at the Maastricht University in the Netherlands. He has more than 25 years experience in the field of life sciences and health nutrition and headed R&D functions at Wander Dietetics, Sandoz Nutrition, Novartis Nutrition, Erdisia Beghin Say, Cerestar Ltd and Cargill Inc, USA. He has published extensively and is a global speaker in the field of Life Sciences and Nutrition. Today he holds a chair in Health Food Innovation at the Faculty of Health, Medicine and Life Sciences within the research school NUTRIM-School of Nutrition and Translational Research in Metabolism of Maastricht University.
Other interesting gluten free wheat alternatives rich in nutrients are oats and pulses. While oats are well known for their high beta-glucan content, more attention is being paid to pulses in recent years due to their excellent protein profile and richness in fibers and micronutrients. The upcoming International Year of Pulses is expected to result in an increased demand for pulse-based products. Bühler is actively involved in shaping the future of pulses as a member of the international pulse task force and has developed a strong portfolio of technologies for pulse processing.

**Gluten-free pasta**

The demand for gluten-free pasta has strongly grown in the past few years. With the Polymatik™ press, launched already over ten years ago, Bühler offers the ideal technological solution for the manufacture of gluten-free pasta. “The original reason to introduce this technology was to offer an alternative in regions where wheat is scarce”, says Beatrice Conde, food science and technology group expert at Bühler. “It is a lucky coincidence that we already had an industrially established solution when gluten-free became a trend. Sales grew overproportionally last year”, says Andreas Kratzer, Head of business unit Pasta & Noodles. Thanks to its flexible technology and long experience, Bühler achieves pasta products of very high quality with its solution. As the only provider worldwide, Bühler made it possible to carry out dough formation and shaping of gluten-free pasta in a single machine with its Polymatik™ press. An additional advantage is that with this pasta press, the two structurally different products (conventional and gluten-free) can be processed from native raw material with only slight adaptations of the equipment. Additionally, the solution impresses with short throughput times, good cleanability also supported by a self-cleaning concept based on a first-in-first-out principle and the option of fast recipe changes.

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Every Minute Counts

Grand Mills Abu Dhabi grinds 1,200 tons of wheat per day and provides flour for over 2 million inhabitants in the entire Emirate. If the mill suffers downtime, there is no flour in Abu Dhabi. That’s why Bühler had to carry out the modernization within the shortest possible time.

For several months, Helmut Gerber and Jochen Schneider, area managers of Bühler, and Nizar Kayali, operations director of Grand Mills, had been discussing the pressing need to modernize the Grand Mills plant in Abu Dhabi. Since its commissioning in 1999, the world had moved forward and both software and control systems were outdated. The time had come to fundamentally revise the plant’s control system, to carry out a retrofit. The new software WinCos in particular offered state-of-the-art functions such as product tracking and central monitoring via computer screen.

“Agreed,” Kayali said after the benchmarks and the price had been negotiated, “but I have to limit the retrofitting phase to 24 hours. We just can’t interrupt production any longer.”

“Now that is a real challenge,” Jochen Schneider thought. Usually, he schedules one week of standstill for the retrofit of such a large plant, so that all tasks can be completed with diligence. But Kayali knew that he could push Bühler a little and still be sure that the target would be achieved. Valuable time was saved during the retrofit because much work could be done in advance rather than “on the open heart”.

The Grand Mills team around Nizar Kayali had to make its own contribution. The storage depots had to be filled to the roof, and all bagging cells had to be replenished with flour before the operation so that orders could still be completed during the retrofit phase.

The retrofit team arrived in Abu Dhabi and prepared everything. The countdown started. On the target date, 15 May 2014, each of the four control cabinets was attended by two well attuned experts who would take care of software and hardware simultaneously. After 12 hours, they were substituted by the second shift. It was silent in the machine halls, which are usually very noisy. Concentration. Every maneuver was precise to a tee. The retrofit lasted less than 24 hours. Afterwards, they tested and modified the parameters, particularly the
Three Questions for Nizar Kayali

**Diagram:** Why did you do the retrofit of your plant? Which advantages did you expect concerning the retrofit?

*Nizar Kayali:* The existing operating system was outdated and spare parts are no longer available, with multiple failures in the PLC hardware due to age, causing downtimes of the production lines. Mele remote support is very difficult since the communication is established through IDSN lines only, limiting the support capabilities of the Bühler team and requiring engineers to provide on-site support, which was costly. The retrofit would provide the facility with an up to date operating system, upgraded functionality, integration of over-the-years facility upgrades, availability of spare parts, and most importantly 24/7 online support. System security was an additional benefit provided by the S7 PLC.

**How have the results of the retrofit measured up to your expectations?**

The retrofit met all of our expectations, the Bühler team delivered a very smooth S5 to S7 PLC upgrade with minimal disruption to the business.

**How did you and your team experience the practical doing of the Bühler team during the retrofit operation?**

Very professional, organized, good planning and most importantly on-time delivery of the project. The cooperation with Bühler in general was very cooperative and understandable.

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power and emergency stop circuits. All men had their eyes on Kayali when he pressed the start button and the first part of the plant went back into operation, and worked. The next task was to meticulously check the newly added process lines and extensions that had been commissioned within the same retrofit operation. After less than 48 hours, the plant’s operation under the new control system was stable and 100 percent reliable. Jochen Schneider says that the team is still very proud of having managed the fastest retrofit of this size in the history of Bühler.
The important Chinese titanium dioxide market appeared to be lost already for the Bühler wet grinding technology. Swiss prices and Chinese market conditions just didn’t fit together at all. But Bühler found a way to recapture the market with new ideas.

The sales team around Zhao Nangang and Mark Traber looked rather disappointed. Once again, they had worked for weeks on an offer for bead mills for the fine grinding of titanium dioxide. The request had come from an up-and-coming Chinese customer. And yet again, its Chinese contact person had laughed, said sorry, and rejected the offer. “So sorry! We trust in you completely and value the quality of Bühler plants. But we simply cannot pay that price.” Mark Traber and his team had gone through the offer with a fine-toothed comb and slashed and saved on costs wherever they could but there was just no more scope for negotiation. At least, not in the old way of thinking.

That’s why that’s exactly where the Centex success story started in 2008. The engineers in Uzwil, Switzerland, developed a completely new generation of bead mills, the Centex™. This technology works at a significantly lower energy level than its forerunners and can produce up to 6 tons of titanium dioxide powder an hour, which is an increase of around 25 percent in terms of capacity compared to its predecessor SuperTex™. The particles are whiter and finer than before and the size distribution is smaller, which are significant quality criteria for the paint and lacquer industry, as well as for most other manufacturers of bulk materials.

But Bühler needed to make just one more move to start back on its road to success in China. Previously, time and time again orders had mainly been lost to Chinese competitors because they copied Swiss or German machines and sold them in China at unbeatably low prices. Non-Chinese suppliers rarely got a foot in the door in Asia. But why shouldn’t Bühler build machines for the Asian market in China itself? The more independently the Bühler subsidiary in Wuxi did this, the better the price/performance ratio could hold its own on the
Chinese market. In plain terms, this meant transferring technology from Uzwil to Wuxi. In the time that followed, experienced engineers from Uzwil supported and coached their Chinese colleagues. Bühler in Wuxi gained its own Research & Development department and reliable local suppliers who met the Bühler quality requirements without exception were sourced – and this was a decisive criterion for success.

The plan worked. With Wuxi Haopu Titanium Co., Ltd., Bühler convinced a key customer, who initially ordered a Centex™ T5 and has ordered a further six since then. The prices that Bühler offers today are competitive on the Chinese market, and the output and reliability of the mills are far superior to that of the Chinese copies.

Thanks to the Centex™ technology and Wuxi Haopu, in recent years, Bühler has acquired many Chinese, Korean and Indian customers. This is because, as savvy business people, everyone knows that excellent quality and top-rate service is worth higher initial investments in the end.

“We've reclaimed a market that appeared to be lost. Wuxi Haopu is even so satisfied that they are recommending us in the industry. We can't just rest on our laurels,” says Mark Traber to sum up, Business Development Manager Asia for Grinding & Dispersion.

This is what Wuxi Haopu Titanium has to say

“We're very satisfied with the Centex™ T5. They are extremely stable during operation and have a high flow rate, mill better than their predecessors, and barely show any signs of wear on the grinding chamber over a long period of time. They require virtually no maintenance, they save energy, and are easy to operate. Bühler has offered us exceptional support during our process optimization and has proven to be a reliable and helpful business partner. The higher initial investment is money well spent.”

WHAT CAN THE CENTEX™ DO BETTER?

- Higher productivity thanks to high flow rate
  - 10 -13 m³/h throughput at a low operating pressure
  - Very large separating sieve surface
  - Ecomizer™ agitating disk design with conveying effect

- Long lifetime, wear-resistant
  - Grinding chamber and other contact parts made of elastic polyurethane (PU) instead of steel
  - Elastic material ensures a longer machine lifetime

- Precise control, stable production
  - PLC control
  - Target parameters can be set
  - Operating parameters can be tracked on the monitor

- Energy savings
  - Energy-efficient operation thanks to innovative mill design
  - Smaller energy consumption per ton of milled product
  - No cooling water required due to low power input

- Applications of Cenomic™ and Centex™ T4/T5 technology
  - Bulk materials such as TiO₂, CaCO₃, talc, barium sulfate
  - Pigment dispersions for printing ink and paint
  - Electrode slurries for lithium-ion batteries
  - Agricultural chemicals: pesticides, herbicides
  - Grinding of ceramic materials
Whitworth Brothers Victoria Mills is a world-class flour mill, successful in the competitive UK market. For 15 years, Bühler has been with them every step of the way: a relationship founded on a shared passion for getting things right.

BY DANIEL WHITAKER (TEXT) AND RAFFAEL WALDNER (PHOTOS)
Archaeologists, anthropologists and historians believe that learning to grow grains and to grind them for eating was the most important step in our path to civilization. Bread became known as “the staff of life.” Certainly, grinding flour has been the source of great success for family-owned Whitworth Brothers, who operate probably the world’s most advanced mill at Wellingborough in Britain’s East Midlands.

The company’s growth in recent years has been prodigious. When its current owner, Martin George, bought out his brothers to take control in 1998, Whitworth Brothers Limited had barely 2 percent of the British flour milling market. Yet today it is the largest player with over a quarter of the free trade flour market.

The battle for British bread

This is all the more remarkable because the UK flour market is not only large – well over EUR 1 billion – but also acknowledged to be perhaps the world’s most demanding in which to trade. On the supply side, a maritime climate that delivers unexpected weather fronts from the Atlantic and North Sea means that cereal harvests are unpredictable, in quality as much as volume.

Roger Butler, Whitworth’s managing director since 2000, holds two wheat kernels up to the fading Northamptonshire afternoon light at Whitworth’s state-of-the-art Victoria Mills complex. Both grains are from the heart of the British “wheat belt,” the flat fertile counties east of the M1 motorway, that are more sheltered from the rains that drench the west of the country. Roger Butler affectionately describes one as “like a lovely plump ball bearing, with just enough length to indicate minimal air trapped within it”. This was grown in 2013’s reasonable harvest. But his face saddens as he indicates the second smaller, more shriveled kernel,
diagram #170

Bühler’s latest Antares roller mills dominate the roller floor.

THE UK MILLING MARKET

- UK wheat harvest: 11.92 m tons
- Wheat milled: 7.50 m tons
- Wheat exported: 1.48 m tons
- Wheat imported: 1.63 m tons
- Flour produced: 4.95 m tons

51% white bread
8% brown and whole meal bread
11% biscuits
2% cake
28% starch and other

(All figures 2013/14 estimates; source: National Association of British and Irish Millers)

- Victoria Mills flour production capacity: 800 tons per day
- New varieties of wheat tested by Whitworth Bros.: 50–100 per year
- Original Victoria steam flour mill started: 1886
- First ever steam flour mill opened (Albion, London): 1786

The domestic harvest matters because less than 15 percent of UK milled wheat is imported – mainly from Canada, Germany and France. So millers need expertise in knowing how to analyze what they are given and how to adapt their milling process to its condition. And the UK’s demand side is no easier to deal with. There is a longstanding native predilection for a wide range of baked goods – from sliced white industrial loaves to artisanal wholegrain, and encompassing sponge cakes, crumpets, fruit breads, and pastries. But the UK’s mosaic population and cosmopolitan tastes mean that Whitworth must also know how to mill for Indian chapattis, for Polish rye breads and for Middle Eastern pita breads. The challenges in both processing inputs and delivering outputs mean that technology is often developed in the UK before any other milling market.

A technology partnership

For a UK miller to survive, let alone to thrive as Whitworth has done, a good eye for investments is essential. These will be in staff; in relationships with suppliers and customers; but primarily they must be
Whitworth chose Bühler fifteen years ago as its main technology partner, and the two companies together have developed Victoria Mills into what is now perhaps the world’s most advanced flour mill.

Roger Butler sums up the reasons for Whitworth’s choice: “Bühler like to challenge the status quo. And just as importantly they do what they say they will. When they face a challenge, they sort it out.” The same might be said of Whitworth Brothers Ltd, and the result is a milling company producing more than 700,000 tons of flour a year compared to just 85,000 tons back in 1999. Apart from conventional flour, there are now four heat treatment plants, offering an additional capability compared to most competitors. But the expanded volumes and product lines are the results, rather than the causes of Whitworth’s success. That success has come through achieving quality control and food hygiene, which customers can rely upon absolutely, and through efficiency that allows consistently competitive pricing.

Focus on hygiene
Operations director Mike Peters enthusiastically demonstrates the process stages provided by the Victoria Mills plant. Wheat is brought in, cleaned, where a powerful shaking mechanism calibrates the flour particles. From here, the flour will descend to the “spout” floor, passing through bran finishers, before the flour is collected on a gentle gathering chain conveyor. This is preferable to the more traditional screw mechanism for taking out the flour for sanitation reasons. A pneumatic conveyance system transports the finished flour to the flour storage and bulk loading bins.

Double control sifting works as a precautionary last defense against anything untoward entering the flour. Infrared NIR technology is used to analyze the final product, checking for mineral, protein, moisture and starch content.

Victoria Mills is capable of processing a range of different qualities of wheat, including those “hard” grains with a high protein content – which produces flour, which best holds the shape when baked. Around 80 percent of the grain is endosperm, the raw ingredient for flour. The remainder, germ and bran, will usually become animal feeds, turned into pellets. But there is great variety in this – with whole meal using all of the grain and, for example, pastry flour using not much more than half of it. The milling technicians will carefully blend grains to order, what is known as a “controlled grist”.

Since 2003 a “peeling” process has been employed to strip off the outside of the grain, which has the benefit of removing pesticide residue. Victoria Mills was the first place that this was done, though it is now applied worldwide. The main milling process is through giant roller mills, occupying most of the “roller” floor of the plant, which will break the kernel. A pneumatic suction system with cyclone separation conveys the intermediate milling stock to the top floor. Finally the flour passes to the “sifter” floor,
At Victoria Mills, stainless steel is ubiquitous, used to avoid product contamination for instance by paint coatings, which might flake off into the flour.

Martin George’s Family Business

Martin George sits under a portrait of his grandfather, who had started as an apprentice to the Whitworth brothers, before persuading them to sell him the firm in the 1930s. Both men look quietly satisfied with what they have achieved. Since Martin George himself took up the reins, buying out his own brothers and family trusts in 1997, the changes have been on a grand scale.

First has come a new concentration on milling, with other businesses in bakeries and cooking ingredients being sold. Then there has been the sustained increase in scale — lifting Whitworth Bros. from twelfth to first place in the national league table of flour millers, going from 100,000 tons a year to a million in just a decade. But linking these two together has been the relentless focus on quality of technique and control of costs.

“We had luck with our location,” admits Martin George, recognizing Victoria Mills’ proximity to ample wheat farming territory and to the best of Britain’s road network, “but we also certainly made the best of what we had.” Across the River Nene — which had once delivered both power for watermills and also an earlier transport network — abandoned shoe and clothing factories can be seen, which show only too clearly what happens when owners don’t adapt and invest adequately.

“The key has been that this firm is a family business, here for the long term,” Martin George says. Public corporations might cut corners so as to favor quarterly results, or sell the business for a quick profit. “But our staff, our suppliers and our customers all know that we will invest as needed and won’t be going anywhere.”

It’s also telling that Martin George’s is far from the only family intimately connected to Whitworth. Roger Butler’s father Bill had been sales director for Martin George’s father, for example. Meanwhile the brother of the current finance director works for Martin George’s son Michael in a private equity firm that may be just the preparation for a later career for both in Whitworth Bros.

As he talks about the relationship with Bühler, it almost feels like Martin George is describing another family member. Certainly the successful procession through one challenge after another has bound the two companies closely together. Martin George reels off the innovations: “Individual storage bins; the first roller mill on the roof of the building; automation so that a single miller can cover four mills. We have learnt as we went along.”
milled, separated into wheat feed – which is pellet – and flour; then finally both are bulk loaded into the yellow Whitworth transporter lorries familiar to anyone who drives the main English arterial roads. In particular, Mike Peters emphasizes quality control – through automated control loops and retractable best practice quality check – and hygienic design. He also explains why this matters: “The UK has some of the most stringent food safety regulations in the world. But beyond this, protecting both our own and the customer’s reputation and brand is our first priority. This is why we have a constant focus on filters. Rubber seals have been switched to more durable metal, and parts that were once made in white are now made in blue, so that they can be seen against the flour.”

Surveying the milling machinery, what first strikes the eye is the gleam of stainless steel. Bühler’s Ernst Hobi, who worked closely with Whitworth in establishing the current plant estate, describes why this is necessary. “Although a more expensive material, stainless steel guarantees no contamination of the flour by flaked off paint or metal coatings, or rust.” Over the years, Roger Butler as come to appreciate that Bühler’s technical knowledge of metallurgy, and of the stresses that will be placed on machinery, is a vital competitive advantage. Without this, initially useful machine parts can suffer cracks, vibrations and damage over time, which will cost money or worse; compromise the safety and hygiene of the flour. Ernst Hobi adds one other advantage of the ranks of stainless steel components: “They’re not only functional but also beautiful. We are engineers, but we have emotions.”

**In good times as in bad**

Whitworth enjoys other strong relationships with stakeholders. Camgrain is a farmer-owned cooperative with over half a million tons of storage capacity that can collect grain from farmers and then provide it to Whitworth. Through Camgrain, Whitworth has acted to support its farmer suppliers through difficult times, and both organizations act in ever closer cooperation with the mutual aim of maintaining product quality. There is also an air of satisfaction among mill employees, including those trained as apprentices – another practice in which Whitworth leads many competitor mills.

But the link with Bühler is a special one, stronger still since the “shockingly” bad 2012 harvest that Roger Butler described earlier. That year became a great test for UK millers, as their customers demanded a consistent product that the available grains seemed unlikely to permit. Yet, Bühler’s analytic, recipe-based adjustment and control functions allowed Whitworth’s expert millers to vary the blending and processing of the grains until an acceptable flour was produced. Whitworth Brothers passed with flying colors – they were, for instance, the only miller that could provide all of supermarket chain Sainsbury’s with UK-only wheat. Roger Butler recounts that “Bühler has given us a flexibility in milling, which allowed us to deal with a very tricky harvest. That’s something that we really appreciate.”

Total automation lets a single miller oversee four separate flour mills.

Sirius plansifters calibrate the flour particles.
The Internet of Things

The Internet of Things connects all kinds of economic goods via Internet. This opens up a host of new opportunities for all industries in the business-to-business domain.

The Internet of Things (IoT), also known as the Internet of Everything or Industrial Internet or Industry 4.0, comes in many guises and will dramatically influence business-to-business relations of all industry sectors in the same way that Internet, social media and mobile devices have transformed the B2C environment and re-defined social interaction.

Government programs in for example Germany, the USA and Japan provide huge support and funding for IoT-based research and development. Estimates of IoT contribution to GDP tend to fall in the staggering range of USD 10 to 20 trillion over the next 20 years. Today more people have cell phones than have access to running water, and more than 2 billion social interactions take place each day. Retail and media have been disrupted, and manufacturing has the opportunity to learn from these examples and move to a new level of productivity, service and differentiation.

Opportunities to enhance process efficiencies, reduce unplanned downtime, provide predictive maintenance or remote servicing are no longer technology-limited. Our optical sensing and sorting capabilities provide quality control and value optimization, whilst control of processing windows to ensure food safe operating conditions and maintaining product quality lead to new generations of intelligent processes.

What is more IoT will be a key enabler in some of our sustainability goals, reducing energy consumption, food losses or improving food security. For example, in the near future we can imagine leveraging our processing technologies across the food value chain from grain storage, through ship loaders and unloaders, sorting, cleaning, flour production to perhaps pasta or extruded snacks, to support our customers in optimizing their value chain. Further, we could combine this with other data such as crop data or weather conditions to build meaningful food system models to support better decision taking and enhance sustainability of food value chains. This would go some way to reducing the 1.3 billion tons of food lost or wasted each year.

Data security is a basic requirement, not only of IoT, but in all activities between customers and suppliers. As always, we continue to take this extremely seriously and realize it is a key area of concern for many customers when data sharing is required. The principal hurdle in capturing the opportunities that IoT offers us are not technological, but are in defining win-win situations in which players in the same value chain can bring sufficient benefits to each other to make it worthwhile to share data and create new solutions. It is clear that only in collaboration will we really harvest the benefits of IoT.

I welcome customers, suppliers or potential partners, who wish to collaborate in IoT or associated fields to contact us and join this exciting innovation journey.
Scientific Publications

IN ADDITION TO THEIR DAY JOB, BÜHLER RESEARCHERS HAVE FOUND TIME TO CONTRIBUTE SCIENTIFIC PUBLICATIONS. HERE’S A SELECTION.

1. Exploring new food safety technologies for grains
   Cereal grains can contain high bacterial loads. For some special applications a microbial reduction step is required. Bühler, together with the Institute of Process Engineering of ETH Zurich and the Zurich University of Applied sciences, has tested the effect of a treatment of wheat kernels inoculated with Bacillus amyloliquefaciens endospores in a low pressure fluidized bed reator in an argon/oxygen plasma.

   Reference:
   Journal of Food Engineering, DOI 10.1016/j.jfoodeng.2015.03.009, 2015

2. New reference book on Rice Processing
   Several Bühler rice specialists co-authored a book on the rice processing along the entire value chain to pool their state-of-the-art expertise on rice, rice milling, rice-based value added products and market insights. The book is considered as the “new standard handbook” for rice milling industry and related professions.

   Reference:
   Web reference:
   www.erling-verlag.com

3. Building a deep physical understanding of dough formation
   In a collaboration between the Max Planck Institute for Polymer Research in Mainz and Bühler AG, changes on different time and length scales during dough development were observed and quantified. A simplified physical model able to explain the main rheological changes was developed based on the view of dough as a continuous gluten polymer matrix into which starch granules are embedded as filler particles.

   Reference:
   Web reference:
   www.mpip-mainz.mpg.de

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Myclimate neutral Printed Matter

diagram #170
One step ahead in processing grains to food. IPACK-IMA 2015.

This is Bühler’s slogan for IPACK-IMA 2015, where it will be introducing an extensive range of solutions for every single link in the value-added chain – from raw materials right through to end product.

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IPACK-IMA 2015 from May 19–23 in Mailand – Hall 3, Booth B15