ALL ABOUT CHOCOLATE
Where are cocoa beans harvested and where are chocolate products consumed? And what is the process behind creating excellent chocolate?

INTERVIEW WITH THOMAS BISCHOF
Thomas Bischof, Marketing and Product Manager for Chocolate, explains about regional preferences for chocolate – and how these market insights translate into benefits for Bühler’s customers.

INTERPACK 2014
Bühler’s booth at the industry’s major trade-show event will be teeming with innovations.

LA IBÉRICA
A tailor-made production line enabled the Peruvian chocolatier to expand its production and preserve its famous, century-old recipe.

MALSA
The Spanish die caster’s excellent reputation has received further boost thanks to its new reliable Bühler equipment.

RUBINMÜHLE
The family-run flour mill based in southern Germany is profiting from substantial cost and energy savings thanks to Bühler’s energy consulting.

SREE VENUGOPAL FLOUR MILLS
The market leader in bakery flour in south India is among the first in the country to install the top-end Antares roller mill.
Dear reader,

This issue of Diagram is dedicated to our customers’ sweetest product – chocolate. We are looking at the whole chocolate cycle, from the cocoa harvest to the processing of cocoa beans, from the chocolate production line to the moulding process – and of course we are also taking a keen interest in how and where chocolate is consumed. In its various forms – be it dark tablet chocolate, creamy truffles, chocolate biscuits or drinking chocolate – there are few foods that are universally so well loved.

Our Marketing and Product Manager Chocolate and Cocoa Thomas Bischof knows about the regional consumer preferences (see interview on pages 11–13). Why? Because what kind of chocolate people like better will impact on which production line is best suited for our customers to be successful in this precise market. For high-end chocolate there still is no better process than dosing, mixing, refining and conching – and Bühler’s portfolio offers the right machine for each of these steps. For compound chocolate products, which have now overtaken conventional chocolate in production volume, Bühler also offers state-of-the-art lines, more recently also compact lines for small to medium batch production.

Finally, if you’re visiting this year’s Interpack in Düsseldorf, be sure to have a look at the newest innovations from our business unit Chocolate, Cocoa & Coffee.

I hope you will enjoy your reading!

Calvin Grieder, CEO
FISCAL 2013 PROVIDES MIXED PICTURE

Bühler looks back on a fiscal 2013 that developed along highly divergent lines in the different business units and market regions. Orders were received for CHF 2,363 million, thus exceeding the previous year’s value by 1 percent. On the other hand, sales revenue shrank by 4 percent. The leaders were the Food Processing division and the Customer Service business, with growth of 7 and 8 percent, respectively.

In North America, Middle East/Africa, and India, order intake declined between 11 and 17 percent, primarily as a result of local currency devaluations. On the other hand, Bühler booked 23 percent more customer orders in South America – a new record. Europe and Asia, too, grew by 11 and 12 percent, respectively. Regardless of the lower EBIT achieved in 2013, Bühler deliberately maintained its high expenditures on research and development of over CHF 100 million and on the global expansion of its local Customer Service organizations. The detailed Annual Report is now also available as an iPad app. www.buhlergroup.com/annualreport

BÜHLER’S WORLD FOOD SYSTEM RESEARCH PROJECTS

As a member in the Partnership Council of the World Food System Center (WFSC), which is based at the Swiss Federal Institute of Technology Zurich (ETH), Bühler is sponsoring two projects. The “Grain Value Chain” project analyzed the global value chain of different sorts of grain and developed a methodological framework to allow evaluating future development of a grain value chain in any country. Further, a model was used to simulate future land use, production, consumption and trade issues until 2050, and will be made available online, to enable decision makers worldwide to interact with models and outcomes. The new project “PRO3” will focus on plant based foods that are rich in protein and may play an important role in feeding the world’s growing population in a more sustainable, nutritious and affordable manner.
URS BÜHLER PASSES ON
THE BATON TO CALVIN GRIEDER AS NEW CHAIRMAN

At the General Meeting in February, Urs Bühler handed over his responsibilities as Chairman of the Board to Calvin Grieder, who will hold this position in addition to his function as CEO. This is therefore only the second time in its 150-year history that Bühler has been chaired by a person who is not a member of the Bühler family. Plans for the medium term are to separate the functions of Chairman of the Board and Chief Executive Officer again.

Urs Bühler looks back on a forty-year career at Bühler. He joined the organization in 1969 and headed it as CEO from 1986 through 2000. He was elected to the Board for the first time in 1981, chairing this body from 1994 onward. During this time, he systematically further developed Bühler into a global Technology Group by successfully entering emerging industries on the basis of innovative technologies and with a “feel” for new markets. Calvin Grieder says about his predecessor: “With Urs Bühler, an eminent personality is leaving the scene who has always led the organization with vision. In an unconstrained combination of retaining proven approaches while being receptive to new developments, he has led Bühler into a global dimension.”

NEW MEMBERS OF THE BOARD OF DIRECTORS

With Karin Bühler, Urs Bühler’s daughter, another member of the Bühler family joined the Board of Directors on the occasion of the General Meeting of February 10, 2014. The strategy of internationalization of Bühler Group is exemplified by the other two new Members of the Board: Linda Yang, General Manager at Bongrain SA (China), and Frank N. J. Braeken, Chief Investment Officer at Amatheon Agri Holding (Dubai). Linda Yang has acted for various global corporations such as Nestlé and Procter & Gamble in China and possesses in-depth understanding of this market. Frank N. J. Braeken, a Belgian, has been with Unilever for 25 years, last as Chief Executive President for Africa.
COCOA STREAM

COCOA BEANS  
100 % – 3,961 kt

COCOA GRINDING  
83 % – 3,288 kt

COCOA SHELLS  
17 % – 673 kt

COCOA POWDER  
32 % – 1,056 kt

COCOA BUTTER  
32 % – 1,056 kt

COCOA LIQUOR  
36 % – 1,175 kt
ALL ABOUT CHOCOLATE

There might be slight disagreements over the preferred variety, but the love for chocolate unites people from all corners of the world and all ages. Here, we ask: Where do the ingredients for our favorite sweet temptation come from? How is the bitter, acidic cocoa bean processed into delicious and smooth chocolate?
COCOA HARVEST

Cocoa is a tree growing in the humid tropics, bearing fruit on its trunk and branches on a continuous basis. Cocoa pods are harvested by hand and carefully cut from the tree without damaging flower buds and immature pods.

The world leader in cocoa cultivation is Côte d’Ivoire (Ivory Coast) with a trade share of approximately 37 percent, followed by Ghana (21 percent) and Indonesia (10 percent). In total, 72 percent of the global cocoa harvest stems from western Africa, almost 15 percent from South America and 13 percent from Asia.

According to the Food and Agriculture Organization of the United Nations (FAO), almost 90 percent is cultivated in smallholdings of less than 5 hectares, especially in Africa. In Ecuador and Brazil, however large estates predominate, and in Asia the two sectors are similar in size.

It is estimated that more than 20 million people depend directly on cocoa for their livelihood. The International Cocoa Organization states that only 0.5 percent of the entire cocoa production is certified as “fair trade”; organic cocoa farming accounts for less.

GLOBAL PRODUCTION OF COCOA BEANS
FORECAST 2012/13 IN THOUSAND TONS

<table>
<thead>
<tr>
<th>Region</th>
<th>Production (in thousand tons)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>2,876</td>
<td>72%</td>
</tr>
<tr>
<td>Cameroon</td>
<td>225</td>
<td></td>
</tr>
<tr>
<td>Ivory Coast</td>
<td>1,480</td>
<td></td>
</tr>
<tr>
<td>Ghana</td>
<td>850</td>
<td></td>
</tr>
<tr>
<td>Nigeria</td>
<td>230</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>91</td>
<td></td>
</tr>
<tr>
<td>Asia &amp; Oceania</td>
<td>515</td>
<td>13%</td>
</tr>
<tr>
<td>Indonesia</td>
<td>430</td>
<td></td>
</tr>
<tr>
<td>Papua New Guinea</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>40</td>
<td></td>
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<tr>
<td>America</td>
<td>595</td>
<td>15%</td>
</tr>
<tr>
<td>Brazil</td>
<td>185</td>
<td></td>
</tr>
<tr>
<td>Ecuador</td>
<td>185</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>225</td>
<td></td>
</tr>
</tbody>
</table>

CHOCOLATE PROCESSING AND CONSUMPTION

Almost 40 percent of the global cocoa harvest is processed in Europe – the remaining 60 percent in equal shares in each America, Africa and Asia. 40 percent of the cocoa beans are processed to cocoa powder and cocoa butter in their country of origin. The end consumer market in turn focuses on industrial and emerging countries.

According to Euromonitor, approximately half of the global amount of chocolate is consumed in Europe (including Russia), 20 percent in North America and 15 percent in Asia and Oceania. More than 25 percent of the Asian chocolate consumption can be attributed to Japan. Growth rates especially in Asia and South America, but also in the Middle East and Africa are strong.

CHOCOLATE MARKET

COCOA SCARCITY

Since 2012/13 the demand for chocolate products has again surpassed the supply of cocoa beans. While climate factors and political crises like the one in Ivory Coast in 2011 had a negative impact on the amount of cocoa globally available, Asia’s new taste for chocolate has boosted demand. With a steady increase in global consumption the gap is estimated to grow even further. ICCO estimates expect a demand surplus of 70,000 tons for the next cocoa year (until October 2014).
FROM COCOA BEAN TO CHOCOLATE BAR

1 Cleaning
The cocoa beans are cleaned to remove foreign material. This important step prevents impairment of the downstream process.

2 Debacterization and Roasting
Debacterization of the cocoa beans efficiently reduces the germ count without affecting the flavor. Roasting the cocoa beans brings out the flavor and color. The temperature, time and degree of moisture are adjusted to the type of bean and the intended product.

3 Winnowing
Gentle winnowing removes the shells from the beans to leave just the cocoa nibs.

4 Grinding
The nibs are grinded in two stages into cocoa liquor (cocoa particles suspended in cocoa butter) with optimal flow characteristics. Thanks to the uniformly distributed energy density in the bead mill, masses are produced with a very narrow particle size distribution.

5 Mixing and Kneading
In the heart of the chocolate processing system, the chocolate recipes are produced. The ingredients – cocoa liquor, cocoa butter, sugar, milk and emulsifiers – are carefully mixed with the high shearing and kneading action producing a homogeneous mass for further processing.

6 Refining
In a next step, the chocolate mixture is refined and its texture but also flavor improved by passing through a series of rollers. Here, Bühler’s two-stage refining process with flexible two-roll and five-roll refiners has set new standards worldwide in terms of quality and efficiency.

7 Conching
This process develops the flavor and rheology of the chocolate, releasing some of the inherent bitterness and finally gives the resulting chocolate its smooth, melt-in-your-mouth quality. During conching the chocolate is continuously kneaded and sheared over a period of hours depending on the flavor and texture desired by the manufacturer.

8 Precrystallization
Bühler seed precrystallization technology produces chocolate articles with improved gloss, denser crystal matrix, and higher strength. It also prevents fat bloom and storage stability can be considerably increased.

9 Depositing and Moulding
Innovative chocolate products with accurate weights are produced with moulding lines specified for the specific chocolate articles. Solid products and hollow or filled articles are produced either by the traditional moulding, One Shot, or cold-stamping process in exactly the desired shape.

10 Automation
To make high-quality products, trouble-free processes and complete traceability throughout the production process are required. Bühler possesses the necessary know-how and can thus ensure an extremely high plant uptime.
"We all love chocolate": Thomas Bischof keeps track of the global and regional developments in the chocolate business.

WORLDWIDE COCOA CREATIVITY

Ahead of the industry’s most important trade show, the triennial Interpack in Düsseldorf, Germany, Bühler’s Marketing and Product Manager for Chocolate and Cocoa Thomas Bischof shares his global market insights and explains why he is fascinated by chocolate innovation in China, the Middle East and in Europe.

Interview by Barbara Simpson
“We designed our latest machines with a focus on modularity and flexibility, enabling fast recipe changes or mould exchange.”

Thomas Bischof

Diagram: Mr Bischof, you have been monitoring the international chocolate and cocoa market closely in recent years. What is your favorite sweet discovery?

Thomas Bischof: With the almost unlimited variety of global chocolate creation in terms of regional preference and ingredients there are many contenders for this title. The innovative potential of artisan chocolate producers is astounding. You won’t believe the variety of flavors – individual chocolate customization is a big trend. And then there are exciting regional developments in emerging chocolate markets, such as the Middle East, where Bühler advised a company on the production of camel milk chocolate.

As the Asian market gained in importance in terms of chocolate consumption, I have also been traveling to China frequently. If pressed to choose a favorite, there is one regional compound product, however, that caught my attention. Packaged in a bright plastic capsule it contains biscuit balls in a chocolate compound mass. Not only do my kids love it, this product is now being copied all over China – a surefire sign of market success! All in all, there is an amazing variety of new products coming out of China.

Apart from satisfying curiosity, why does Bühler – as an equipment manufacturer – need such detailed insights into the end consumer market?

Bühler’s aim is to engineer our customer’s success. This is no empty catchphrase. We must not only know the challenges our customers are facing, we have to anticipate them. That’s why we research and trend scout what our customers’ customers like – also in different regions of the world.

Our development cycles run over two to three years. But we want our customers to be able to react to consumer preferences immediately, not in two years’ time when the trend is over. This is why we designed our latest machines with a focus on modularity and flexibility, enabling fast recipe changes or mould exchange on the chocolate line. Our consumer insight has a direct impact on our customers.

You mentioned China as an emerging consumer market. How has this development affected the producer landscape?

International companies have recognized the importance to ramp up their local production capacity in order to be closer to the end consumer, not only in emerging markets in Asia such as China, India and the Middle East but also in South America. In addition, the multinationals are even setting up local R&D in order to better adapt their products to local trends and preferences. So this is not just a short-term hype – they have long-term objectives.

In consequence, Bühler massively expanded the service, sales and R&D network in China, with hubs in Shenzhen and of course in Wuxi. In the future, we will also produce our equipment in Asia.

With all eyes set on Asia, what are the lessons for the global chocolate industry?

Asia is by no means a homogenous market. Take for instance Japan, which has a long and proud tradition of making fine chocolates. Then we have cocoa-producing countries such as Indonesia, who are now becoming chocolate processors and consumers. There is a wide quality and taste range between those countries. So one lesson would definitely be: Be flexible to cater to regional or even local tastes. Another is: Learn how to react to the scarcity of raw material – because this is another consequence of the new emerging confectionery markets in Asia and South America.
Indeed, global chocolate consumption is predicted to reach 8 million tons per annum by 2017. Do you reckon cocoa scarcity is a serious threat in the future? Definitely. We will simply need more cocoa to satisfy demand. The number one constraint for growth in the chocolate industry already now is the availability of cocoa. This is why the sustainability programs that most large cocoa processors maintain are vital. They encourage farmers who might prefer short-term profit from faster growing plants such as banana or palm trees to plant cocoa trees, which only bear fruit after three or four years. Thus, the basic supply of cocoa can be secured – but will this be sufficient to answer the rise in demand?

There will also be a switch to other products, which contain less cocoa. Biscuits and compound chocolates are two of the product categories that will grow – two or three times faster than chocolate.

How are these trends – customization, new consumer markets, cocoa scarcity, more compound products – influencing Bühler’s equipment?

On the equipment side these trends translate into flexibility and modularity. Flexibility means: How can I produce very different kinds of product to satisfy the end consumer’s taste for variation on the same line – with minimal time and product loss? Modular equipment design, in turn, enables to cater perfectly to the most diverse customer requirements. A good example is our ChocoStar™ Compact moulding line, assembled individually from standardized modules to form a customized moulding line. The elements are also pre-configured for automation so modules can be simply added and exchanged. For us, this makes it easier to engineer and faster to produce the equipment. Finally, we can offer the line at a better price for the producer. It’s a win-win situation.

Further big trends, which are implemented across the whole Bühler portfolio, are of course food safety and hygienic design, intelligent control systems and energy efficiency. This is actually a requirement you will find in Bühler’s R&D guidelines: a new machine always needs to be more energy efficient than the previous one.

A final word on the general outlook: Has the chocolate business been affected by global crises and recessions at all? During the financial crisis of course people spent less money on expensive products, but overall the same amount of chocolate was consumed. We all love chocolate and we eat it when we are happy and when we are sad – so generally, that’s a great business outlook.
BÜHLER AT INTERPACK 2014

At its inspiring 1,200 m² booth area, visitors will experience Bühler’s passion for cocoa, chocolate, coffee and many other products firsthand – and grab one or two coffees on the way. In addition to innovative technologies that help to manufacture products with greater efficiency and increased food safety, a special focus will also be placed on global service offerings and automation solutions. For chocolate production Bühler will introduce new compact solutions for lower capacities, thus also addressing the needs of small and mid-size producers. Here are some of the highlights to look forward to.

COCOA PROCESSING

Major trends in productivity, efficiency and flexibility have been addressed by Bühler engineers by developing new solutions in cocoa processing. One answer is the Barth-Tornado RSX. By combining convective and conductive heat transfer, the Barth-Tornado RSX increases throughput by up to 20 percent and offers a wider range of flavor profiles. Bühler will also underscore its competence in cocoa grinding by presenting a beater blade mill and a bead mill. Last but not least, the new WinCos® R2 control system for cocoa processing opens up new dimensions in plant control.

CHOCOLATE PROCESSING

Innovations in the DoMiReCo™ (dosing, mixing, refining, conching) chocolate process show hygienic design at its best and new intelligent control systems. Further highlights are Bühler’s new compact solutions for small and mid-size chocolate producers. Best examples for this are the new systems SmartChoc™ and MicroFactory™ for chocolate mass and compound production as well as the Choco-Master™ Compact, which is a chain conveyor moulding line.
FOCUS

COFFEE PROCESSING
The coffee roasting innovation **RoastMaster™ 60** air-recycling drum roasting system will be on display. In the grinding section, the focus will lie on achieving precise particle size distribution and bulk density with the latest generation **GrindDefine™** grinder series. As a partner for complete customized coffee manufacturing solutions, Bühler also offers processing expertise in capsules and single-portion coffee products.

NUT PROCESSING
Integrated solutions will be presented for processing different kinds of tree and ground nuts. Whether customers are pure nut processors or chocolate producers searching for ingredient production systems, Bühler has the appropriate solution for their success.

OTHER SOLUTIONS
Bühler will also feature solutions for the production of breakfast cereals – from raw materials handling to the finished product, based on the company’s vast knowledge in extrusion. Moreover, visitors may discover novelties for drying and sorting of different materials. Last but not least, innovative solutions for grain handling will be among the exhibited technologies.

“INNOVATING YOUR SUCCESS”
Visit Bühler at Interpack 2014, Düsseldorf, Germany
May 8–14, 2014
Hall 03, stand no. D28

- More than 10 new machines, more than 20 exhibits in total
- Numerous lectures and events
- Solutions for cocoa & chocolate and coffee processing, drying, sorting, extrusion and flour handling
- Customers are invited to join the after-work-party at the Bühler booth on May 8 at 6 pm.
THE SUCCESSFUL PERUVIAN CHOCOLATE RECIPE

La Ibérica produces its famous specialties strictly in accordance with the recipes developed by company’s founder Juan Vidaurrezága Menchaca, some of them 100 years ago. A carefully customized production line supplied by Bühler has enabled the unique flavor and quality of La Ibérica chocolate to be preserved despite sharp growth and high production pressures.

By Andreas Fink  Photos: Alex Kornhuber

La Ibérica scored initial success by producing simple drinking chocolate, a welcome energy source in the mines of the Peruvian south. But it was not long before the company added premium chocolate, pralines, truffles and marzipan made from Brazil nuts to its range of products. For almost 56 years, Juan Vidaurrezága Zimmermann, the company founder’s eldest son, has headed La Ibérica. “We produce our chocolates today in exactly the same way as we have always done: using sugar, powdered milk, cocoa mass and pure cocoa butter,” explains the CEO. The European Union today allows chocolate makers to add five percent cheaper fat. “Not in our company,” replies Juan Vidaurrezága categorically.

Yet, times are changing for the chocolatier Vidaurrezága family in the southern Peruvian city of Arequipa. “We have increased our output by a factor of five within ten years,” says development manager Jaime Vidaurrezága Zimmermann, one of the four brothers on the company’s Board of Directors. The steady growth with which La Ibérica is trailing Peru’s boom in the new millennium requires new capital investments.

Growth while maintaining quality
Quality remains a top priority – also when it comes to expanding and updating the plant and equipment. Since November 2012, the company has relied on Bühler machinery for production. In a secondary production area, a TT60 batch roaster, an SCS-4 mill, and a FineGrind™ bead mill roast the cocoa beans and grind them into a fine cocoa liquor. The various ingredients are weighed by hand in exact accordance with La Ibérica’s traditional recipe and then homogeneously mixed in a flexible twin-shaft mixer. From there, the product passes through a Finer™ M 1300 five-roll refiner and is finally fed to an ELK 1.5 V conche.
To date, La Ibérica had never seen such a complete solution. “We had a museum in the production hall,” jokes Juan Vidaurrázaga about the agitator mill dating back to the time of the company’s initial steps and which is still used today for processing small batches. “In looking for new machines, our production size proved to be a problem. While others calculate in tons, we calculate in kilos,” he says. “This is why we are extremely glad that Bühler offered us a complete production line that accurately matched our needs.”

The right solution

The requirements the new production line was expected to meet were clear: It had to be capable of processing the highly aromatic, characteristic Chuncho cocoa variety so that the end product would taste as it had for the last 100 years. In 2011, Bühler invited Jaime Vidaurrázaga to produce chocolate in the technical laboratory in Uzwil, using all the original ingredients brought along from Peru. The Bühler team found the right solution to satisfy the wishes of the Peruvians. “Our cocoa needs to remain many hours in the conche,” explains production manager Javier Vidaurrázaga.

The ELK 1.5 V conche, which according to standard recipes runs for eight to twelve hours, was programmed in Arequipa for a running time of twenty-four hours. It now delivers the aromatic, intense product that melts on your tongue and which has made La Ibérica one of the best chocolate-makers in the Americas.

81-year-old Juan Vidaurrázaga can now retire, knowing that he has preserved and enhanced his father’s heritage – without ever changing the successful chocolate recipe.

For more information:

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Clockwise from top left: Finer™ M, the flexible, high-grade five-roll refiner for smaller batches, is here combined with the versatile twin-shaft mixer VersiMix.
Milk chocolate hearts.
Frisse ELK™ – a multifunctional single-shaft conche.
The FineGrind™ bead mill offers efficient fine grinding of cocoa liquors.

LA IBÉRICA, AREQUIPA, PERU

1909: Juan Vidaurrázaga Menchaca starts producing the first tablets of drinking chocolate.
1920/30: La Ibérica develops a range of products, still produced today with the identical ingredients: chocolate tablets, pralines, truffles, marzipan, toffees and turrónes.
1949: After the death of the company’s founder, the company experiences a difficult phase.
1958: The two eldest sons, Juan and José María, take charge of the business. Juan Vidaurrázaga is head of the company to this day.
1982: The acquisition of a plot of land in an industrial park allows the production to be gradually moved out of the city center, paving the way for further growth.
Since 2000: La Ibérica evolves into a national brand and increases its output by a factor of five within ten years.
2012: La Ibérica starts up a Bühler production line in its factory in Arequipa.
470 employees produce some 900 metric tons of confectionery every year.
Annual sales are about 13 million U.S. dollars.
MALSA, a Spanish foundry, has established an excellent reputation in the marketplace and is today acknowledged as being one of the first names for delivering top quality. With its new Bühler die-casting machines, MALSA has slashed its reject rate – even when manufacturing difficult components.
“Thin sealing edges, outstanding sealing action, tight tolerances, and a complex geometry,” is how MALSA manager Carlos Sanchez describes the challenges the company faces when die-casting the component family for the CPV valve casing. With a total output of about 1,500,000 parts a year, this Spanish foundry must rely on equipment that guarantees top-notch quality, a minimum reject rate, and on-time deliveries to customers. The company has operated three Bühler three-phase die-casting machines for almost 17 years. In order to further improve its results, MALSA decided to invest in its die-making and machining departments.

Better results achieved by Evolution 42 Compact
A year ago, the foundry in Toledo received an Evolution 42 Compact machine from Bühler with a real-time-controlled shot system. “Ever since, we have slashed our reject rate by 70 to 80 percent in producing the four different components that we cast on this machine,” explains Sanchez. Where as much as 7 percent used to be produced – due to the difficulty of casting the critical parts –, the average is now no more than 1.5 percent. MALSA satisfies all the quality requirements: “Our cast components do not have any porosity in the cartridge bores and only micropores when thicker wall sections are involved, which do not accumulate and might connect the air ducts,” says Sanchez.

MALSA is one of the busiest customers in Spain and cannot do without Bühler’s technology to manufacture its demanding components. In collaboration with Bühler process engineers, the company is aiming at maximizing the overall efficiency of its equipment.
“We have slashed our reject rate by 70 to 80 percent in producing the four different components that we cast on this machine.”

Carlos Sanchez

Equipment Efficiency, OEE). This means it must minimize the reject rate and ensure a fast cycle time and high uptime of the machine. Bühler will continue to play an important role in MALSA’s expansion projects.

“Festo Supplier Elite Award”

In 2013, MALSA was distinguished as the best vendor of die-cast components in Europe by Festo – the leading provider of pneumatic and electrical technology. “At the start of every year, Festo agrees on a target with each vendor,” explains Sanchez. A maximum PPM (parts per million) complaint rate is defined, and the vendor’s quality management system and on-time delivery rate are checked. Other important factors include the technological capabilities of the company, its cost price, its behavior toward the environment, and its cost-to-performance ratio. This produces a total number of points at the end of the year on the basis of which vendors are rated on a scale ranging from A (good) to C (poor). With its high number of points, MALSA was presented the “Festo Supplier Elite Award” last year. Festo also uses this rating as a benchmark for other vendors, continuously narrowing down the values and thus spurring suppliers to further improve their performance.

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MALSA, TOLEDO

The Festo Award consolidates the reputation of this Spanish company as being one of the best suppliers of die-cast components. The company can still tap additional development potential by entering new business fields and signing cooperation agreements with companies in Asia and India.

MALSA was founded 25 years ago in Aranjuez as a vendor to the Bosch company. In 1992, the factory was acquired by a new team who planned to specialize on casting difficult components for the entire European market, using complex dies and manufacturing parts satisfying stringent sealing requirements.

From 1994 through 1997, the company purchased three new Bühler die-casting machines (one 250 kN and two 400 kN). They have enabled MALSA to achieve its goals – to increase its capacity, enhance its quality, improve its process technology, and invest in its die-making and machining shops.

Today, MALSA offers customers not only high-quality die-cast components, but also completely processed products including assembly and surface coating. In addition to its foundry in Toledo, the company also operates machining centers in Moraleja de Enmedio.
LESS ENERGY, LOWER COSTS – HIGHER EFFICIENCY

Grain mills consume lots of energy. Rubinmühle in the southern German town of Lahr processes more than 100,000 metric tons of grain a year. For this, the company needs a little more than eleven million kilowatt-hours of electric power – as much as 2,500 four-person households do. The integral energy consulting services provided by Bühler allow a few percentage points to be trimmed off this total.

The mill in the German Rhine valley has been owned by the Rubin family since 1684. It used to be a classical flour mill, but started specializing in oats processing some 65 years ago. “Thanks to its exceptionally high content of vitamins, nutrients, and minerals, oats are a healthy grain and are becoming increasingly popular,” says Christopher Rubin, who together with his father Karl-Rainer and his father’s cousin Rolf heads the company with its 150 employees.

Running in three shifts a day, the mill processes 180 metric tons a day – mainly oats – into flakes, bran, flour, groats, or cut groats for the food industry throughout Europe, from Spain to Moscow. “You can find our products in almost every German supermarket,” says Rubin, who worked for almost ten years as product manager at Bühler in Switzerland before joining the family-owned company.

The mill’s second important line of business, with an output of about 100 metric tons a day, is extrusion: the thermo-mechanical processing of grain flours, meals, and semolina into crunchy flakes, crispies, or granular products for making muesli, yoghurt, chocolate, and bakery goods. With a daily output of about 80 metric tons, the classical flour mill today only plays a subordinate role at Rubin.

Certified energy management

Every year, the company pays some EUR 1.4 million for the power it taps from the public grid. To this must be added a contribution stipulated by the so-called “Erneuerbare-Energien-Gesetz, EEG” – a law designed to finance renewable energies and thus bring about the German energy turnaround. This accounts for roughly 50 percent of the total cost. But companies can reclaim this contribution if they introduce an energy management system certified to DIN-Euronorm ISO 50001 and fulfill a number of additional conditions. In order to renew the certificate this year, the company set its main focus on cutting energy consumption in the oat mill. It is operated at the full capacity utilization rate and therefore accounts for a considerable share of total energy consumption.
This was a model task for Bühler, which had after all supplied the mill’s entire equipment. “We chose Bühler to conduct this energy analysis because it has all the experts that know our processes,” explains Christopher Rubin. The oat mill’s capacities had tripled within the almost 20 years of its operation, with more and more new equipment being added which changed the overall picture of the plant.

Substantial savings

The Bühler experts looked into the entire process, from raw materials reception and grinding to packing. They conducted extensive talks with the company’s employees, who use the equipment day in, day out and know its characteristics. They reviewed the sizing of the drives as well as the compressed-air volume used in the steadily expanded plant. “In energy consulting, it is important to always bear in mind the overall process and the interaction between its individual components,” explains Christian Hilber, Head of Customer Service Sales in the Grain Processing division.

The comprehensive analysis, which is one of the factors for obtaining refunding of the EEG contribution, produced a list of recommendations for improving the energy balance of the oat mill. It included concrete energy and thus also cost savings plus information on the required capital investments and the payback time. The potential savings that Bühler calculated for the oat mill are considerable: 350,000 kilowatt-hours annually, which is equivalent to the consumption of 70 households. The first measures have already been implemented: Together with Bühler, the company is now updating its aspiration system. And the next analysis is already in the pipeline, looking this time into the energy-intensive extrusion section.

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For the first time in its over 300-year history, the Rubinmühle plans to expand beyond its location in Lahr-Hügsweier: The company is building a new oat mill with a daily processing capacity of 120 metric tons in Plauen in Saxony. Already today, Rubin buys part of the oats it processes from the Czech Republic. The new location is no more than a 45-minute drive from the border. The new mill, which Rubin is investing tens of millions, is scheduled to be commissioned in 2015. Its technical equipment will again be supplied by Bühler. This decision is due to a large part to Bühler’s innovative services.

**ADDITIONAL LOCATION**

**RUBINMÜHLE, LAHR-HUGSWEIER, GERMANY**

- Family-owned since 1684, before that owned by the Margrave of Baden
- Processes 180 metric tons of grain a day into flakes and 100 tons into extruded products, plus 80 tons of wheat, spelt, and rye into flour
- 150 employees
- 24/7 operation
STRIVING FOR MILLING PERFECTION

Sree Venugopal Flour Mills, a market leader in bakery flour in southern India, has been a Bühler customer for more than a decade – a time in which the company saw a massive rise in demand thanks to their excellent quality product. Now it is among the first in the country to install the top-end Antares roller mill.

“Milling is an art. And with Bühler, we are learning to perfect it,” says Madan Kumar (57), Managing Partner, Sree Venugopal Flour Mills. The 85-year old company was initially specialized in semolina, with a mill situated right in the heart of Bangalore. Today, while the city mill is still there, it’s the two Bühler mills in Whitefield, in suburban Bangalore, have given the company market leadership in the bakery flour segment.

Until the 1990s, the family-owned group expanded into other cities in southern India. Then in 1996, the group split and the flagship company came to Kumar’s father, S.M. Prabhakar, and his two sons. In 2002, the patriarch took the bold decision of ordering a complete Bühler mill, when far cheaper alternatives were available in the market. “My father insisted on investing in the best,” explains Kumar.

“Initially, we wanted to increase capacity by 150 tons per day,” says Kumar. But Prabhakar, an octogenarian who still takes keen interest in the company, insisted on taking a long-term view. Consequently, in 2012, the company went in for the state-of-the-art Bühler Antares mill, made of stainless steel, with an installed capacity of 300 tons per day.

“High-quality flour boosted demand

Soon enough, what seemed like a huge gamble began to pay rich dividends. The company primarily supplies flour to the wholesale market. “Our end customers – which are essentially bakers – were extremely happy with the quality of flour,” says Karthik Sreerama (31), Kumar’s son and a partner in the company. Within a decade, demand outstripped supply and the company decided to add another mill at Whitefield.

The second time around, Bühler was a logical choice. “We saw so many advantages – energy efficiency, superior and consistent quality, safety, hygiene and so on,” says Sreerama. In addition, over the last decade, the company has seen no major breakdown. “Thanks to
the automation solution – WinCos® 2 – technical glitches get resolved within no time at all, either online or offline,” says Sreerama. The sensors and hooters help identify problems and lead to easy resolutions.

Big plans for the future
Following the commissioning of the Antares mill, Sree Venugopal Flour Mills is looking at several new business plans. In the short-term though, it wants to close the city mill due to the ever-increasing traffic congestion in Bangalore and instead ramp up production in Whitefield, which is today around 250 to 300 tons per day. The company also is looking to enter into the whole-wheat atta flour market – the traditional flour variety is regaining popularity amongst health-conscious Indians because it contains more fiber and vitamins. Again, the company plans to rely on Bühler.

In the long-term, the company wants to build huge wheat silos in order to address the issue of storing high-grade wheat throughout the year. Further strategic plans include diversifying into custom milling to provide customers with the customized flour of their choice. It seems like Sree Venugopal Flour Mills is on a good track to milling perfection.

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Family business: Madan Kumar, managing partner, on the right, and his son Karthik Sreerama, who is a partner in the company.

SREE VENUGOPAL FLOUR MILLS
- Established in 1928 in Bangalore with an installed capacity of 2 tons per day.
- Installed capacity in 1953: 70 tons per day and later modernized in 1983.
- 1996: A three-way split in the company. The flagship company goes to S. M. Prabhakar.
- 2002: Commissioning of the Bühler mill in Whitefield, Bangalore, with an installed capacity of 150 tons per day. Total capacity: 220 tons per day.
- 2013: Commissioning of the Bühler Antares mill at Whitefield with an installed capacity of 300 tons per day. Total capacity: 520 tons per day.
- Plans for the future: Diversifying into whole-wheat flour, getting into custom milling and setting up grain handling infrastructure.
The dream of every brewery is to produce perfect beer with an individual, unmistakable, and consistent flavor. Beer brewing includes many discrete process operations – which Bühler ensures are all perfectly matched, acting as a reliable and competent partner for the dry process stages of the brewing process. This includes malt and raw grain handling, cleaning, and grinding.

The newest innovation rolled out for the brewing process is a carefully thought-out grist mill that sets unrivaled standards in terms of food safety, ease of operation, and safety. The new Maltomat™ III ensures optimal malt and raw grain yields while maximizing the chaff volume and achieving a high throughput capacity. To meet needs for different throughput rates, the Maltomat™ III comes with three different roll lengths and four different modular design versions so that any conceivable requirement is covered.

Ultimate optimization
The Maltomat™ III is characterized by its new technical solutions and its state-of-the-art design concept. Its screening system with optimized stroke, frequency, and throw and its large chaff screen area make for outstanding separation of the chaff and of the coarse and fine grits. The powerful roll pack with its direct drive, the automatic grinding gap adjustment mechanism, and the sampling points after each roll pass guarantee high precision and operating reliability. The motor size can be individually selected for each pass to obtain optimal and powerful raw grain grinding.

Operation has also become easier and is based on the principle of open Bühler machine control. All settings can be saved as production formulas, enabling grinding gap adjustments to be carried out automatically. All operating elements are linked with the master control system and can also be accessed through mobile communication devices. The maintenance and cleaning concept facilitates access for cleaning and enables fast roll and screen changes. Another innovation concerns the machine’s high safety standard – with technically maximized explosion protection specified for malt dust.

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The new Maltomat family has been systematically designed on the basis of a modular system. Three roll lengths are available, with a total of four design versions. The product volume determines the roll length: 500 millimeters (mm) for 1 to 5 metric tons per hour (t/h) of barley and wheat malt, 1,000 mm for 5 to 11 t/h, and 1,500 mm for up to 16 t/h. As a simple solution for satisfying a wide range of grist requirements, a combination is possible with a two-roller mill, a four-roller mill with a second additional grinding pass, or a four-roller mill with a screen module. The heart of the Maltomat family is a modern six-roller mill that is also equipped with a screen module plus an additional third pass for reducing grits.
INNOVATIONS

INTELLIGENCE IN OPTICAL RICE SORTING

Bühler’s new flagship rice sorter, the SORTEX S UltraVision™, features individual defect detection technology, enabling processors to adjust the sensitivity of each defect, individually and in parallel.
The latest addition to Bühler’s high-capacity UltraLine for rice processing – engineered for outstanding productivity, coupled with lower running costs – is an optical sorter that addresses challenging market conditions and changing consumer requirements. Its most sophisticated and highest-capacity optical sorter yet, the SORTEX S UltraVision™ significantly increases rice processors’ profitability, by allowing them to define the exact quality level required, even from the most highly contaminated rice. Yield is not compromised, which enables processors to deliver increased value for money to their customers.

Advanced, proprietary technologies
The SORTEX S UltraVision™ is packed with innovative technologies. One of them is the SORTEX ProSort™ software, pre-programmed to detect the detailed characteristics of individual rice varieties and defects. Another is the user interface with easy, press-button control, allowing swift changes from one rice product to another, or one quality standard to another, thus significantly reducing costly downtime. Using Bühler’s Textured LED Lighting™, defects that are almost imperceptible to the human eye, can now be detected together with proprietary-designed multi-chromatic “Ultra” cameras. Additionally, Bühler’s intelligent new Crosshair Targeting™ Technology improves the accuracy of the ejection of rejects, even at very high capacity processing.

“OUR TECHNOLOGY HAS TAKEN A LEAP FORWARD”
Three questions for Neil Dyer, Global Product Manager for Bühler SORTEX

What is the biggest achievement of the new SORTEX S UltraVision™?
“Until now, optical sorting technology available to rice processors only allowed the functionality to adjust the sensitivity for all defects on one control. The UltraVision changes this – our technology has just taken a leap forward, with built-in intelligence enabling the sorter to make intelligent decisions about which grain is acceptable and which grain should be rejected.”

Why is this level of intelligent sorting needed?
“Over the past few years, contamination levels in rice have been increasing and the defects have become more subtle – therefore becoming more difficult to detect. SORTEX technology helps them to meet the many different levels of rice quality standards required in the market and enables them to remain competitive.”

How does the technology improve processors’ market position?
“If processors seek to achieve a specific rice quality standard, flexible and complete control over grains to keep and those to remove is essential. A yellow kernel will have to be removed, a light grey kernel might remain, depending on the quality standard. Bühler’s individual defect detection capability provides processors with unprecedented product control. This will also eliminate unnecessary waste. By doing so, this increases profitability.”
Bühler’s new fully automated sample collector MZET is employed in grain processing and is used to collect whole kernels, semolina and flour samples. It complements the sampler units MZEA and MZED, automatically collecting up to 12 samples. With its high automation level, the sample collector provides maximum process reliability: Its sensors help to prevent overfilling and repeated filling of previously filled containers. Thus, a consistent quality of retention samples may be achieved.

To further preserve the sample’s quality, each container is sealed after being filled to prevent the samples from drying out. This ensures that the moisture content and, thus, the sample’s unique characteristics, remain unchanged even over longer periods of time.

**Flexible sample identification**

Complemented by an optional printer for code or barcode labeling, or an RFID data storage unit, the sample collector MZET also enables automated sample identification. The user-friendly setting of the collection parameters may be carried out by either using the unit’s own electronics or via the central control system of the mill.

Flexibility is one of the decisive features of the new collector. It may be fitted with either five-liter or ten-liter containers and is converted easily from one to the other. The special mechanism also allows for the quick replacement of full sample containers. Another bonus is its compact design and small footprint, which mean that it can be easily implemented in limited spatial conditions.

**MULTIPLE SAMPLE COLLECTION MADE EASY**

Today, representative sampling is a key element in maintaining the highest quality standards in grain milling – by enabling rigorous and consistent control of product quality. The sample collector MZET is the ideal solution for the automatic collection of up to 12 samples.

The containers can be easily replaced thanks to a special mechanism.
COMPACT CONTINUOUS MOULDING

The new ChocoMaster™ Compact is the perfect fit for desired outputs between 500 and 2,500 kg per hour. Based on the proven technology of its “big brother”, the ChocoMaster™, the compact continuous moulding line is the latest addition to Bühler’s portfolio of compact moulding lines, striking the perfect balance on footprint, output and investment.

With variation and flexibility trending in the chocolate business, Bühler has the right answer for chocolate manufacturers who are looking to produce smaller to medium-sized batches of their moulded delicacies. Instead of running a large-sized moulding line below capacity, Bühler’s customers now profit from a range of compact solutions. The latest addition to the compact family is the ChocoMaster™ Compact, which will be introduced at this year’s Interpack in Düsseldorf, Germany. It follows in the footsteps of the ChocoStar™ Compact, the pioneering loose mould line launched in 2011, which has already proven its worth in chocolate plants from Japan to South America.

Innovative Hygienic Design

Without ever compromising on Bühler’s renowned quality standards, the ChocoMaster™ Compact line produces solid articles like tablets with and without inclusions, bars and pralines, one-shot filled and also aerated articles. While one engineering goal obviously was to cater to a medium core output range, additional benefits include a smaller footprint, further improved energy efficiency and the latest standards in food safety.

Special consideration was given to a dedicated hygienic concept. Thus, easy accessibility to all areas, inside and outside, for facilitated cleaning is guaranteed. All process steps are fully visible – from mould exchange area to the PowerShot™ depositor with quick-exchange system, the centerpiece of the line. All structures and sheeting are made from non-corrosive materials. It is this striving for excellence in engineering along with exceptional service standards that is part of every Bühler solution, whether large-scale or compact.

With its compact and modular design, the ChocoMaster™ Compact enables full capacity production of smaller batches.
Since 2009, Bühler has been expanding its Grinding & Dispersion facilities in China. The reason for this focus shift, says Business Development Manager China, Mark Traber, was the increasing spending power of China’s middle class, and the resulting consistent growth of related industries: “By observing the Chinese market we knew it was the right decision to relocate our efforts so we could develop solutions locally for one of our most important markets.”

Bühler set up an application center for general grinding and dispersion in Wuxi and enhanced its production capacity of bead mills, roller mills and mixers, catering to the inks, paints and coatings industry, as well as to the electronic pastes and battery industry. A local process engineering team consults customers in their language, assisted by experienced sales engineers. “Our biggest assets are our knowledge of the local supply chain and the local machine production,” says Traber. Bühler customers also profit from regional service centers with experienced engineers, spreading from north to south and west to east of China.

Tight margins
One of the industries that profited directly from higher spending power is the packaging inks business, epe-
riencing an annual growth of up to 15 percent. When consumers buy more packaged goods in supermarkets, there is also more packaging that needs to be labeled – with packaging inks. However, the value chain in the Chinese inks and coatings industry is increasingly squeezed and the margins are under continuous strong pressure. Hence Grinding & Dispersion customers are on a quest for more productivity using the latest technology solutions – but on an investment level which meets the local market conditions.

Answers to market requirements
This is why the local product development team in Wuxi engineered competitive solutions for bead milling, roller milling and mixing applications – based on established Bühler technology, and adhering to the same strict and uniform quality standards that Bühler applies worldwide. “We would never compromise on quality. The secret to cost efficiency,” explains Traber, “lies in optimizing the supply chain and in innovative technology transfer.” The strategy paid out, and from their market insight Grinding & Dispersion gained access to hitherto unknown market segments, especially in electronic pastes but also in the ink business.

One of the new customers Bühler could welcome thanks to its attractively priced solutions was Jiangsu Zhongrun Ink Co. Ltd., whose activity focuses entirely on the Chinese market. The company saw the perfect fit for their requirements in a comprehensive Bühler solution “made in China” for the production of sheet-fed offset inks for packaging with a capacity of 10,000 tons/year. At the heart of the plant are the bead mill Cenomic™ and the three-roll mill Trinomic™. This is just one example how Grinding & Dispersion’s local set-up has helped to meet customer expectations and to succeed in an extremely competitive market.
In 2013, 19 apprentices went abroad to Bühler subsidiaries worldwide – in China, the US, India, South Africa and Germany.
BÜHLER’S APPRENTICES HAVE AN INTERNATIONAL OUTLOOK

Bühler has been offering apprenticeships for almost 100 years. Some years ago, in order to attract the best talent and to prepare their apprentices for a globalized business environment, the company set up an international exchange program.

Switzerland is proud of its dual education system. And rightly so. The apprenticeship system provides vocational, practically oriented education for young adults. Swiss youth unemployment rates are among the lowest worldwide – also due to its excellent standards in vocational training. While many countries have been looking to Switzerland to understand and copy this success story, Bühler has gone further and exported some of its Swiss apprentices to Bühler subsidiaries worldwide to experience cross-cultural work in a globalized market environment.

The Bühler way
At its headquarters in Uzwil, Bühler offers apprenticeships in 12 different disciplines. After middle school, young adults can apply for the three- or four-year vocational training, for instance as draftsperson, precision mechanic, sheet metal worker, automation technician, or commercial specialist. While the first two years are spent at Bühler’s dedicated training center covering the basics, the 3rd and 4th year of the apprenticeship is spent at the company itself in their chosen area of specialization with up to two days of school each week.

Attractive destinations
But shortage of suitable talent in the technical or commercial disciplines has also hit the apprenticeship level. This is why Bühler decided to support their promising talent even more and at the same time make their vocational training more attractive for highly talented young people. Since 2008, some of the best apprentices have the opportunity to spend two to four months abroad at Bühler’s Chinese headquarters in Wuxi, and the range of destinations has since been broadened to include also Johannesburg, London, Bangalore, Braunschweig or Minneapolis. Currently, 20 apprentices – i.e. 25 percent of each class – qualify for the international apprentice experience.

Innovation in education
“The apprentices profit from a broad training and have the opportunity to spend some time abroad. Our young professionals take on an active role in our subsidiaries across the globe. In China, for instance, the apprentices pass on their know-how to semi-skilled staff and collaborate on projects with them,” says Andreas Bischof, Head of Professional Education at Bühler. Further benefits include intercultural experiences, higher self-confidence and more autonomy. The continuous classroom education, however, proved a challenge, to which Bühler found its own solution. Its remote learning system “ClassUnlimited” opens up the physical classroom with video screens to include apprentices in China and South Africa. In Minneapolis, Bühler USA reacted to the shortage of skilled workers by initiating its own apprenticeship academy. Maybe some of the 6 apprentices currently training each year as customer service engineers will also widen their horizons with an exchange to Uzwil?
BÜHLER’S CHINESE CHOCOLATE CHAMPIONS

Embedded in a highly dynamic market, the Chocolate and Cocoa Team of Bühler China is fast becoming a global center of competence for compound chocolate production. Its expertise is an invaluable asset for Bühler customers, not only in China but worldwide.

The Chocolate and Cocoa Team was created in 2012 and is based at Bühler’s Chinese headquarters in Wuxi. It comprises 25 highly motivated young professionals from the areas engineering, R&D, customer service, application laboratories and sales. With this broad expertise across the whole value chain Bühler supports its customers’ own transition into the emerging chocolate markets. Detecting local trends early and developing technological solutions for these trends locally – not only for China but also for comparable markets such as India or South America – is a key concern for R&D.

“We are proud to be working for a long-established technology leader. In addition, we have the opportunity to become experts in confectionery industry, in the areas of equipment and process technology,” says Jeff Mo, Head of R&D. It’s an opportunity the chocolate engineers in Wuxi seized with exceptional dedication and speed. Already in October 2013, the young team commissioned their first innovation, the SmartChoc™ system for the production of small batches of chocolate and compound masses with bead mill, mixer, and mixing-conche – a process solution tailor-made for the emerging chocolate markets. “Bead mill applications for the chocolate industry are our specialty,” explains Jeff Mo their rapid success. “But our work also profited from Bühler’s extensive know-how as a market leader, support from other relevant business units and from the close collaboration with our customers.”

The Chinese Chocolate and Cocoa Team also operates local customer service stations with four dedicated service engineers as well as a laboratory for roller mill, conche, bead mill and also coffee roasting trials. In line with the company’s credo “in the market – for the market” the team will create value for Bühler customers in their highly dynamic market.
CURRENT DIE-CASTING COURSES

The five-day “Process Optimization” course is held seven times a year in the training facilities of Bühler in Uzwil, Switzerland. Beside classroom work, it also includes hands-on exercises and demonstrations.

The course provides a general overview of the fundamentals of metallurgy and explains in an easy-to-grasp way how to optimize shot profiles and analyze shot parameters. In addition, it deals with possible ways of monitoring the process as well as detecting and correcting process faults. Moreover, course attendees concern themselves in depth with process optimization issues (quality/cycle time), an approach to casting that reduces wear and tear on the die, plus die-spray technology and temperature control. The course is rounded off by casting trials in the Bühler test facility and a tour of the local manufacturing shop.

You will find the detailed course agenda through the following link: www.buhlergroup.com/die-casting-training

Target group: production staff, product developers, and technologists
Languages: English and German

You will find our complete range of course offerings from all divisions and business units at www.buhlergroup.com/training-courses

SELECTED TRADE SHOWS FROM MAY THROUGH OCTOBER 2014

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For more information, please visit www.buhlergroup.com/events