IBIE 2013 – Technical Innovations

Company profile – Always moving

Report – Weight divided exactly

Plant construction – Doughnuts from Austria
Flexible and hygienic bag discharge. The new Bühler discharge station is versatile and flexible to use thanks to its modular design. Depending on the type, bags or big bags and bags combined can be discharged at one station. The compact machine combines a hygienic design with an ergonomic work process. It also convinces by its simple product feeding and its rapid sieve changing for which no tools are required. Flexible, fast and hygienic – this is the new era of discharging.

www.buhlergroup.com

Bühler AG, Grain Milling, 9240 Uzwil, Switzerland, T +41 71 955 11 11, F +41 71 955 66 11 milling@buhlergroup.com, www.buhlergroup.com

IBIE 2013 in Las Vegas, NV
October 6 - 9, booth 9841

Bühler Discharge Station. For bags and big bags.

Maximum flexibility.
Modular and expandable design, customized to individual requirements.

Top sanitation.
No dust formation, no product deposits, no foreign material.

Powerful discharge.
Optimized, circular sieve movement guarantees high throughput.

Easy maintenance.
A wide opening provides easy cleaning and fast sieve changing.

Ergonomic operation.
User-friendly tipping without additional platform.

Innovations for a better world.
Every three years, Las Vegas is the meeting place for the market participants of the international baking technology, mainly from North, Middle and South America. The biggest city of the US State Nevada is not really known due to the IBIE exhibition place but rather famous for its big casinos, impressive hotels and spectacular shows. However, for many professional visitors, the fair attendance - and with this, their job - will have top priority. On four days, more than 800 exhibitors expect roughly 20,000 visitors and inform them about new technologies, ingredients, raw materials and much more. You will get a first overview on the presented innovations in our preliminary report. It is completed by a report on Codex by Rondo. The company, represented by the General Manager, Christian Becker Sonnenschein, will exhibit at this fair in America for the first time and will show its innovative C1 process. In this process, a continuous dough band is directly transferred from an extruder to a laminating machine. The advantages of the process are a shorter production line and reduced production costs. Certainly, the last argument also applies to the use of robots. Furthermore, they meet high hygienic requirements and serve for humanising the workplace. However, they are still used in the food industry to a small extent. Therefore, in his professional article, Prof. Dr. Herbert J. Buckenhüskes is giving an overview on the time-related development and the state-of-the-art. It is accompanied by a current report on a German bakery which has been using a robot for eight months. Thanks to good planning the „new employee“ could be integrated in the stacking process of dough boards. A new constellation can also be found in France. The President of Mecatherm, Bernard Zorn, speaks about their transfer to the French financial syndicate Wendel. It shall provide a long-term perspective and planning security to the manufacturer of ovens, machinery and automatic production systems.

The Chairman of Mecatherm Bernard Zorn has all of the company in mind. Particular attention he followed the trends of the markets and their implementation by the development department.

The reports, interviews and specialist subjects around the line production in the industrial baking industry are again manifold and informative. Anyhow, you should not miss the visit of the IBIE. And, who knows: Perhaps, you will have the fortune that favours the bold after you have done your work.

Have fun reading.
Your editorial team.
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Dividends at Flowers Food

The American bakery group Flowers Foods is to pay out a quarterly dividend of USD 0.1125 per share to its shareholders. Latterly the group cut the dividends in May by almost 30 percent to the current amount. The next quarterly dividend payout will be on 13 September 2013. Taking the year as a whole 0.45 USD will be paid out to shareholders. This corresponds at the current share price of USD 22.15 (Status: 19 August 2013) to a current dividend yield of 2.03 percent. The group is based in Thomasville in Georgia and is one of the biggest producers of packaged bakery foods in the USA. Flowers Foods runs 44 bakeries and also operates in the retail and food service sectors. Since the start of the year earnings per share on Wall Street have been 89.29 percent in the red and the company has a current market capitalisation of USD 4.61 billion.

Pepperidge closes production in Aiken, SC

The changing bakery products market and ever stronger competition have caused Pepperidge Farm Inc. to close its bakery in Aiken, SC. The 40-year old production facility is no longer in step with the times and is to be closed gradually. Other reasons were the low production capacities and the discontinuation of Goldfish Bread which was primarily produced in Aiken, SC. It is expected that the remaining products will be relocated to the plant in Lakeland, Florida. The gates are due to close for the last time in March 2014. The announcement of the bakery closure came one week after the ground-breaking ceremony for the USD 93 million expansion of the biscuit and cracker plant in Willard. As part of this two-year project Pepperidge will install a new Goldfish Cracker production line and purchase 227,000 square foot of space.

Bimbo USA closes Easton

In mid-August Bimbo USA announced that it would be closing its factory in Easton Pennsylvania by the end of the year. The factory which employs more than 200 people produces bread rolls for hamburgers and hot dogs. „It was a difficult decision because the team in the Easton bakery is very committed“, said Rod Cunha, vice-president of manufacturing. „However, the age of the bakery and its geographical location makes the competitive situation difficult“ The announcement was made about seven months after Bimbo had purchased 30 hectares of land in Macungie Township, Pennsylvania in order to build a new bakery at a cost of USD 75 million. This new bakery should create more than 100 jobs in the region and will produce bread and rolls for the north-east USA. The Macungie Bakery plans to start production in early 2014.

Canada should remove trade barriers for food

On the one hand Canada is pushing forward bilateral and multilateral free trade through the relevant agreements, but at the same time is continuing to maintain trade barriers to protect its food industry. However, these barriers limit the opportunities for the country to become a stronger player in the increasing global food demand, writes the Conference Board of Canada in a new study. At the same time they are impeding Canada’s prospects of concluding further free trade agreements. Canada is one of a small group of countries in the Organisation for Economic Cooperation and Development (OECD) which exports more food than it imports. At the same time the country is perpetuating the high customs tariffs for dairy and poultry products and also has relatively high duties on beef and veal products, wheat and barley. According to the study, food represents the biggest obstacle to concluding a free trade agreement with the EU which has now been under negotiation for over four years. The Canadians want greater access to the European beef and pork markets whilst the Europeans would like to supply more cheese to Canada. „The Canadian practice of extremely high trade barriers for commodities which are subject to supply management, obstructs Canada’s trading opportunities with other less protected agricultural commodities such as beef and pork“ continues the study. Other countries will restrict access to Canadian agricultural products for as long as Canada maintains its trade restrictions.
Argentina speeds up approval for new GM crops

The Argentinian government wants to ensure that in future new developments in genetically-modified crops (GMOs) can be brought to market more quickly. Therefore it has streamlined the approvals procedure for such crops. In the past approval was only granted for their cultivation if approvals for their use as food and animal feed were already in place in the important export markets, primarily in Europe. As notified by the information service transgen, this prerequisite condition no longer needs to be met. After the USA and Brazil Argentina has the world’s third-largest land area under GMO cultivation, currently almost 24 million hectares. The overwhelming part, 20.2 million hectares, is cultivated with soya beans, where GM varieties make up 98 percent of the total. Maize is grown on 3.3 million hectares in this South American country. Here the GMO share is 85 percent. In 2010 the Argentinian government instructed the then newly established Ministry of Agriculture to study the local rules and responsibilities in the Green Genetic Engineering regulatory framework and to reform them. During this process the ministry experts ascertained that due to the coupling to the generally protracted approvals process in Europe, newly developed GMO plants were coming onto the market later in Argentina than in other agricultural counties. This also led to a situation where Argentinian farmers had to stay with a GM crop for 12 years, according to a quote in the journal Nature Biotechnology by the Biotechnology Director of the Argentinian Ministry of Agriculture, Martin Lema. The new guidelines for farmers and the agricultural sector introduced by the Ministry of Agriculture in spring 2013 should enable the Argentinian approvals process to be shortened from the previous average timescales of six years to four. In the opinion of observers, the reform of Argentina’s GMO approvals regulatory framework and the associated separation from EU import regulations also makes clear the decreasing importance of Europe as a trading partner of Argentina. It is also an indication of the increasing importance of its agricultural trade with China, as the country has now become the world’s largest importer of soya.

Opening celebrations at David’s Cookies

On 14 August David’s Cookies opened its new headquarters and production facilities in Cedar Grove, New Jersey with a big celebration. The company has invested about USD 15 million in its 160,000 square foot facility. Following the inauguration it was announced that the plants in Fairfield, New Jersey and Longwood, Florida are to be merged. David’s Cookies were founded in 1979 and produces and sells cookies and frozen cookie dough to the food sector. Another successful market for the company is online trade.

+++ Withdrawal of Monsanto. The American agricultural group Monsanto is withdrawing all pending approvals applications for the cultivation of genetically-modified crops in the European Union. The announcement was made by a company spokesman in Brussels. However, a new approval for the GM maize variety MON810 will continue to be pursued. The EU-Commission confirmed the announcement and stated that it „was aware“ of the company’s decision.

+++ Horstmann Group takes over Riehle. For weeks after insolvency proceedings were opened at Aalen-based Riehle Maschinenbau GmbH, a specialist in lye application and open kettle frying machines, business operations were sold on 01.07.2013 to the Bielefeld-based Horstmann Group. Horstmann Group also owns WP Bakerygroup, which has supplied both artisan bakers and industry with machines and equipment for over 100 years.
Food service brands with revenue growth

In the USA the 100 biggest food service brands generated revenue increases of about USD 213.7 billion (approx. EUR 162.9 billion), equivalent to growth of 5.3 percent. The number of outlets also increased by 1.1 percent to 184,600. Therefore every branch generates revenue of USD 1.1 million (approx. EUR 0.83 million).

In first position is McDonald’s (USD 35.6 billion; EUR 27.15 billion) followed by Subway (USD 12.1 billion; EUR 9.22 billion) and Starbucks (USD 9.2 billion; EUR 7 billion). Next in line are Burger King, Wendy’s and Taco Bell. The best results were achieved in the bakery café sector with growth of 11.9%, with this sector being dominated by the brand Panera Bread. The biggest revenue volume of the Top 100 is generated by the burger sector, over casual dining and sandwiches. Looking at average revenues per branch, in the lead was the The Cheesecake Factory with revenues of USD 10.081 million (EUR 7.688 million). McDonald’s on the other hand generates revenues of USD 2.5 million (EUR 1.9 million) per branch.

Trade fairs 2013

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Trade fairs 2014

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News from Las Vegas

In this year, the IBIE in the United States is again a meeting site of the market players which are involved in the area of industrial baking technology.

WP Bakerygroup, Booth 8430

Discover Treasures

Under the slogan „Discover the WP treasures“, the WP Bakerygroup presents its latest technologies for the production of premium-quality baked goods at the IBIE 2013. Also the head machine RS Admiral of Winkler, especially developed for the production of bagels and exhibits of WP, Riehle, the youngest WP subsidiary, will be present for the first time. The presented roll production line PANE is the first machine in which the movement of the inner drum of the rounding station can be varied by controls. This improves the intensity of the rounding process resulting in gentle handling of the dough, even for very soft dough, and ensures high dough output. The special dividing and rounding principle of the Pane is reflected in the high quality of the baked goods. The dough pieces that only require a comparably short relaxation time after the rounding process show an increased volume of 20 to 25 percent after baking. In addition, the so-called Accurator provides a completely new principle to the bakers. By simply switching over they can decide between cutting of products of precise shape or precise weight.

Facts

IBIE
Where: Las Vegas, Convention Center
When: 06 October - 09 October 2013
Opening times: On Sunday to Tuesday from 10.00 a.m. – 05.00 p.m.
On Wednesday from 10.00 a.m. – 03.00 p.m.
GBT, Booth 8845

Fully-automatic Equipment

At the booth of GBT, represented by the Managing Director Wolfgang Fuhst and the Area Sales Manager Michael Faber, the professional visitors will obtain information on the dough divider for bread. This machine is available in a two- to six-row design and has proven in industrial use. Soft or fully fermented, as well as firmer dough can be processed. Other characteristics of the Olympia are the wide range of weights, the robust design and the good accessibility for cleaning. Besides the cultivation of existing contacts, the further expansion of the American and South American market has priority. Especially in the last mentioned regions, the two experts see very much potential in the food area, the bread processing and the installation of fully-automatic lines.

Brabender CWB, Booth 10514

Measurable Qualities

Already since 1955, the subsidiary CW Brabender Instruments, Inc. has been existing in South Hackensack, New Jersey. The company is offering high-quality instruments for testing the physical characteristics and the quality of grain and flours to the mills, bakeries and many other industries. The wide range of products is used for the preparation of samples, research and development, evaluation, quality assurance, development of new products and production environments in the food industry. Using the Three-Phase-System of Brabender, consisting of Farinograph, Extensograph and Amylograph, the production chain of the bakery is simulated in the laboratory scale with a practical orientation. In addition to technical changes, for instance kneading time, water intake, or proving time, the results can also be used for changing the recipe or to improve the final product.

Diosna, Booth 8607

Kneading Equipment on Demand

In Las Vegas, Diosna can be found at the booth of its representative Rondo. The exhibition team is lead by the Managing Director, Dr.-Ing. Wolfgang Eißer, and shows the whole range of kneading technology. One exhibit is the Diosna Wendel Mixer WV 240 A. With a batch volume of 160 to 400 kilograms, the dough reaches an hourly output of up to 4.000 kilograms of dough. The wheeled bowl is easy to manoeuvre and to handle and is locked with tongs as standard. For especially firm dough, e.g. in case of bagel dough, an optional gear drive for the kneading bowls is available. Smooth surfaces which can be cleaned easily and sufficient ground clearance facilitate the cleaning process of the kneader. They also exhibit their spiral kneader and a kneading plant with Contino Mixx and high-pressure pre-kneader, which could be interesting especially for industrial application.

BVT, Booth 11235

Compact Information

At the booth of BVT, the Sales Manager Peter Vos and the Marketing Manager Rogier Vos inform the visitors via videos, images and information material about the new plants and the various final products that can be produced with these machines. In the well and fast developing markets in the States and South America, BVT sees the chance to offer turnkey solutions to the existing and potential customers - a core competency of the Dutch enterprise. Many conversations have already been planned before and imply a successful exhibition.

In addition to the laminating machines, BVT Bakery Services also offers a wide range of conveying systems, fermentation, cooling and freezer towers.
**König, Booth 6140**

*Dough Treatment for Small Baked Goods*

At this trade fair, König will present its modular plant Combi Line for the production of small baked goods showing the treatment of half baguettes, Kaiser rolls, Bolillos and Portuguese rolls every day. This plant can be operated with the head machine Classic Rex Futura in five, four or three rows and is suitable for small baked goods in various sizes and shapes, for instance round rolls, stamped rolls, long-rolled rolls, Hamburger and Hot Dog rolls, and convoluted rolls. The Combi Line provides a pre-rolling unit, a prover, a stamping station with round and oval reversible cups, a forming station for long rolling and flattening procedures, a seeding unit, as well as a setting unit. Their branch in the USA with its head office in Ashland, Virginia, has expanded its team by an additional sales- and service engineer in 2013 to better cover the whole country. In addition, König has already built up a wide ranging network of sales and service partners in South and Middle America because this is a market of high potential.

For its Combi Line, König is offering a wide range of exchangeable stamping tools for the production of special regional rolls.

**AZO, Booth 6607**

*Solid Materials, Fluids, Controls*

AZO Inc. wants to use the IBIE to show its newly developed presentation to the professional public in the baking industry. For this purpose, it emphasizes its three new business areas for solid materials, fluids and controls. The new presentation shall provide a precise and clear image of the new structures to the customers and with this, it communicates a new start. In addition to the provided information materials, the company presents its new BG fluid homogenizer and a control system for demonstration purposes. The present sales team is not only supported by colleagues from Prosco, the Mexican branch, but also by employees from the head office in Germany.

**Bühler, Booth 9841**

*Homogeneous Mixing*

Corresponding to the increasing international significance of the exhibition, Bühler will be on site with different experts to meet the customers’ country-specific requirements at the best. Food safety, automation, checking of recipes and process optimization are the main topics of their exhibition appearance. Among others, they will present the Sanimix MRMA. The horizontal method allows a fast mixing process while the large outlet flap ensures the discharge in a few seconds. As a paddle and chopper mixer, this plant is equipped for dry and special mixtures. Furthermore, four model sizes, two surface structures and many options allow the adaptation to customer-specific demands and requirements. Next to it, the Swiss people present a sack / big bag filling unit, a micro-dosing unit and the latest generation of pneumatic locks, completely in a rust-free design.

**JBT, Booth 10015**

*Hygiene Design*

For Dan Plate, the Sales and Marketing Manager for North America, the year 2013 has been very busy. Due to falling grain and soybean prices, the positive trend could continue over the next year. At its exhibition booth, JBT Food Tech takes up the trend referring the need of improved cleanliness within the company and presents the new hygiene concept for the spiral tower Frigoscandia Gyro Compact with a Clean-In-Place system for independent, automatic cleaning. On a small floor area, the tower is also offering high capacity. In the field of industrial baking technologies, JBT Food Tech is also known as a builder of baking ovens. In this segment, among others, the company will present the Stein Pro Grill and the Double D continuous oven in Las Vegas.
**Forbo Siegling, Booth 5128**  
*Transport- and Process Conveyors*

Forbo Siegling focuses its exhibition presentation on transport and process conveyor belts that optimally support the bakeries in achieving their targets with respect to food safety, productivity, cost saving and sustainability. Furthermore, at the fair and later, the relationships to the final customers and associations shall be deepened to improve the understanding of their requirements and the market demands. This philosophy in connection with a reasonable extension of the range of offered products and services as well as putting the emphasis on innovations went down well with the customers. So, the turnover in North and South America could be increased by 50 percent since 2007.

**NEW RHEO F4**

**Control Fermentation Properties of your Dough**

**Principle**

- The new Rheo F4 is the only device in the world that is capable of measuring in one single test:
  - Dough development
  - Dough gas production
  - Dough porosity
  - Dough tolerance during fermentation

These parameters are essential to control the volume of the final products.

- The new Rheo F4 is fully automated and PC driven

**Applications**

- Optimal time for baking
- Effectiveness of additives (ex: Gluten Vital)
- Fermentative capacities of frozen dough
- Gluten-free products

And many more...

**Rondo, Booth 8607**

**Gentle Dough Processing**

For the first time, Rondo will present its new industrial dough band former Midos (Multiple Industrial Dough System). This dough band former processes all types of dough and does not need any dusting flour or process oil. In the industrial area, Rondo has also extended the ASTec programme (Advanced Sanitary Technology). ASTec lines combine the well-known Rondo-advantages with a sophisticated modern hygienic design. More than 25 contact partners, among others, the new CEO Michael P. Witzak, justify themselves to the professional public and give advice and support in the various presentations of the exhibited plants. Because the economic environment in America has improved for the last years and the South-American market develops very well, Jerry Murphy, President of Rondo North America and Canada, expects a successful trade fair with a high interest in the presented innovations and product ideas.

Transilon transport and process conveyor belts made of modern plastic are a good alternative to cotton conveyor belts in the production of baked goods.
The new improver: Time

The Polish bakery goods manufacturer Inter Europol produces large volumes of starter doughs for wheat and rye bakery products using equipment supplied by Daxner International.

In the fiercely contested market for pre-bake goods, manufacturers are searching for USPs which differentiate them from the competition. The objective is to convince the customer to such an extent that when placing an order he selects one's own company. An important element in the product offering of the Polish manufacturer Inter Europol is its consistent use of rye sour dough and wheat sponge in its bread and biscuit production. The pre-bake producer from Marki, not far from the Polish capital Warsaw, has invested for years in the technology supplied by the system builder Daxner International, which installed the components and has gradually built the system up to the level it has today. Working on a three-shift cycle, 500 employees currently process approximately 30 tonnes of rye sour and 45 tonnes of wheat sponge per day. This is a real success story when one considers that Wojciech Śmiechowski and Peter Mitsch got together in 1995 to produce bakery products in an area of 60 square metres. After only three years the premises became too small and the business partners acquired a new site where production still continues today. Expansion is still continuing. Customer growth has come mainly from food retailers, discounters, major customers, the catering sector and the deep-freeze sector and when viewed together with the convincing products and Inter Europol's well-planned product concepts, this has made additional expansion necessary. The new plant located 20 minutes away from the firm's current site is already planned and according to project manager Rüdiger Stollmeier should start operations in autumn 2013.
Sour dough

The requirement for rye sour from flour and coarse meal for the bakery products to be produced also increased in line with the company. Recently Daxner International installed additional fermentation tanks in which the sour doughs fermentate. The system builder has now installed ten fermentation tanks with a capacity of 2,500 litres which continuously supply production with sour dough. However, first of all the individual components must be mixed in one of the two 2,000 litre mixers. Like the fermentation tanks the mixers also have a three-wall outer cover. Therefore, if all fermentation tanks are filled, they can be converted into a storage location. This increases the flexibility of production yet is rarely used due to high throughput levels. First of all the required quantity of flour or coarse meal is weighed and then added through a direct connection to the mixer. A separate pipe is also installed for the necessary water. Also linked to the mixers are the two tanks in which the storage leaven is produced separately and stored. When all components are in place the mixer starts to move and mixes the individual ingredients thoroughly. Then the sour dough is pumped into an empty tank for fermentation. A dedicated extraction pipe is available for each type in

Left photo: Ten tanks each with a volume of 2,500 litres give the sour dough sufficient time to fermentate and ensure the necessary capacity.
Middle photo: A powerful motor with a connected mixer is mounted above the tank in order to reduce the volume of the rising sour dough.
Right photo: Different connections such as the water and volume control shown here are required to smoothly control the automated process.

Left photo: The latest capacity expansions in the production of sour dough of a further two tanks took place in 2012 and 2013. Middle photo: All tanks, both for sour dough and sponge, are mounted on load cells in order to precisely control the processing sequences. Right photo: The pre-dough mixer mixes the individual components of the wheat sponge with a mixing screw to form a homogeneous mass.
order to avoid any cross-mixing. The fermentation tanks are also naturally equipped with a mixer to keep the rising sour dough moving and thus to reduce the volume. The sour dough is then transported by type through further separated pipes to the weighing stations where smaller storage tanks are installed and from which the sour dough and other liquid components may be requested. This action speeds up the weighing, because the individual ingredients do not have to be transported long pipe distances. This is certainly an aspect to be considered since Inter Europol processes about 30 tonnes of rye sour dough every day.

Wheat sponge

The volumes for wheat sponge are somewhat higher. For this the bakers require about 45 tonnes per day and which are prepared in a Daxner system installed in 2011. Two weighing scales operating one behind the other ensure the batch supply of the pre-dough mixer with flour. Whilst the required volume is being weighed in the upper weighing scale, the lower weighing scale can simultaneously supply the pre-dough mixer. The liquid components of the wheat sponge are continuously made available and transported via the relevant connections to the mixing screw which generates a homogeneous mass. The wheat sponge then arrives in the fermentation tanks via a system of pumps and pipelines. The system was initially only designed for three tanks with a volume of 5,000 litres. ‘If we had predicted how quickly we would reach system capacity, then we would have installed four tanks from the outset. Therefore we had to retool quickly but with Daxner’s planning foresight the installation was smooth’ says Stollmeier explaining the individual construction phases. After the fermentation period in the tanks the system pumps the wheat sponge into the 6,000 litre capacity storage tanks. During this process a plate heat exchanger is interconnected and which cools down the wheat sponge by over 20 degrees Celsius to the desired storage temperature. The whole system is time and temperature controlled and may be operated and controlled both by a control unit directly on the system and via the computer in the production office. Cleaning is very important both for sour dough and for wheat sponge in order to avoid any subsequent spontaneous fermentations. The respective tanks are cleaned with an automatic cleaning programme and the pipelines with a pig. The system guides residues through the relevant pipes into the available drainage outlets.

Conclusion

At Inter Europol the people in charge have clear ideas on how competitive products have to look. Sour dough, wheat sponge and the processing of soakers give the bakery products their specific character manifested in a long freshness period and an individual aroma. These quality components are also attractive from a cost perspective since their use enables the use of baking agents to be reduced. Another factor in this success story is the flexible production process which is able to
accommodate individual customer requests. To achieve these the modern technology in use is enhanced by manual activities in specific places. The product range covers 35 gram party rolls to large loaves. 500 employees work 24/7 on 13 production lines to produce the bakery products. The core competency of the company is the production of bread and bread rolls. Most of the production is frozen, either as raw dough or part-baked. The 9,000 industry standard palette capacity of the deep freeze store enables production to produce large volumes which can then be buffered in the store. 60 percent of the goods produced remain in Poland with the remainder being exported. „With a proportion of only two percent, Germany plays a minor role in our international business. The market is very fiercely contested and Inter Europol only has a presence there with a few niche products“ says Mitsch. The situation in Poland is very different where the company is represented in Warsaw and the surrounding area with 28 of its own shops and its own logo and is known across the whole country through supermarket chains and large customers.

Gregor Vogelpohl
Innovating conveying solutions for 65 years

Ashworth, the conveyor belt specialist, provide the baked goods industry with solutions for transporting baked goods from preparation to packaging.

In addition to conveyor belts being used in proofers, ovens, coolers and freezers, conveyor belts also connect these individual system components of line production and thus provide smooth intralogistics. The belts must be selected based on the different product properties, from dough to finished baked goods. In addition height differences in the system configuration require special synchronisation effects. And we must not forget the considerable differences in temperature along the production process that reach way over 200 degrees Celsius in the oven down to minus 45 degrees Celsius in the spiral freezer. Baked goods manufacturers expect solutions that guarantee a smooth line production process for all the different requirements. With more than 65 years of experience with innovative conveyor belts and the largest number of conveyor belt patents, including those in the field of food processing, the American company, Ashworth Bros. Inc, from Winchester, Virginia, along with European Sales & Service headquarters in Amsterdam, The Netherlands is a reputable and competent partner. In 1967, Ashworth invented the...

The Omni Pro 150 belts are in use in German bakery plants. As seen on this SAB Barth freezing tower.
industry’s first spiral lotension system. This revolutionary invention has been the industry standard in freezing, cooling, and proofing spiral systems throughout the world. The company supplies its products to OEMs and food manufacturers world-wide.

**Conveyor belts**

Ashworth’s many years of experience and its great potential in the field of intralogistics can be documented using selected examples. In 1946 the company founded a new business division for metal products in Worcester, Massachusetts and began manufacturing metal mesh conveyor belts. Less than ten years later, in 1955, the conveyor belt manufacturer relocated to Winchester, Virginia, where the head office of the conveyor belt business division is still located. In 1959, Ashworth invented the first turn-curve belt called Omni-flex. Predicated on the company’s earlier Flatwire belt design used only on straight running conveyors, the Omni-flex belt was designed with slotted holes instead of round holes to accommodate the connector rods. The Omni-flex belt was then able to negotiate curves to the left and right and even turn in a circular configuration. All Omni-flex belt components are precision crafted of high quality stainless steel. In addition, two rows of heavy duty bar links are provided as standard and give the belt the ability to operate in high tension spiral systems. The designers minimized friction and wear in order to increase the service life of the belts’ components. The smooth surfaces with no sharp edges make transportation easier without leaving marks on the baked products. It also makes cleaning easier and considerably improves hygiene. A variety of sizes and options have been developed in the past few years during which the belts have been running precisely and reliably. The traditional applications for Omni-flex are proving, cooling and freezing, particularly in the pizza industry but the model is also used for transporting and packaging. Different belts again are required for ovens. Here too Ashworth had already developed a solution called the CB5 Baking Band early in 1963 and this is still the standard for oven belts today in the baking industry. Each belt is precisely manufactured and then tracked electronically in the factory before shipment in order to ensure directional stability. The CB5 Baking Band is woven to stringent tolerances in order to minimize the stretch or sag in the belt and thus increase service life. The flattened wire surface of the CB5 Baking Band’s tightly woven mesh offers excellent relief of cooking gases, with good product support for all dough’s. The belt density maintains even heating for uniform heat transfer to the product across the width of the belt. When installing the product in the oven, the Model I and Model II control systems are an important part of the installation and help maintain belt alignment. The Model I Control system consists of a basic frame, three horizontal rollers and four vertical rollers. The Model I Control system has the same critical vertical rollers but no horizontal rollers, and is attached directly onto the conveying system frame. Both systems are available either with steel bearings or even longer lasting zero friction hard ceramic bearings. Ashworth has developed these special
dynamic rollers to monitor what are particularly sensitive areas for bakers, the places where the goods go in and out of the ovens and also to monitor the correct alignment of the belts at the relevant crossover points. When purchasing a CB5 Baking Band control system and installation supervision by an Ashworth service technician Ashworth guarantees that the CB5 Baking Band will operate with less than 25 inch total waiver. Ashworth is also very successful with the Cleatrac belt and Sprocket system that was specially designed in 1988 to transfer small products between conveyors. It consists of a conveyor belt made of precision-engineered wire mesh with pin-roll style drive sprockets, filler rollers and shaft support bearings. The wire mesh belt is available in various materials and wire configurations for a range of applications. The Cleatrac belt and Sprocket system offers precise alignment by using pin-roll style sprockets that engage the precision engineered wire mesh that retains its dimensions even in fluctuating process temperatures. This positive drive system is better value for the money than chain-edge constructions and offers greater production output, lower maintenance costs, improved product quality and a longer belt service life than chain belts. In order to guarantee correct product alignment and to reduce product damage, the Cleatrac belt and Sprocket system runs smoothly around the smallest transfer diameters in the industry down to 5.1 millimetres. Ashworth’s Omni-Pro belt line introduced to the baking industry in 2005 continues to be one of Ashworth’s best-selling spiral system products. It is currently available in pitches ranging from ¾ inch to 1-1/2 inches. The Omni-Pro belt is the strongest grid type belt on the market today. The increased strength of the Omni-Pro comes from the new 360 degrees button-less weld technology utilizing a “zero tension” design which allows for a higher load bearing capacity. Unlike a traditional bridge weld design used on previous grid belts, the 360 degrees button-less weld is free from surface imperfections and crevices, which improve hygienic characteristics by eliminating the possibility of microbial entrapment. The vastly improved weld design, the patented protrusion leg and the patented coined link design combine to reduce cage bar wear, belt elongation and increased belt life in the most demanding lotension spiral systems. The four belt types already mentioned only give a small overview of Ashworth’s wide range. The product range is con-transfer small products between conveyors. It consists of a conveyor belt made of precision-engineered wire mesh with pin-roll style drive sprockets, filler rollers and shaft support bearings. The wire mesh belt is available in various materials and wire configurations for a range of applications. The Cleatrac belt and Sprocket system offers precise alignment by using pin-roll style sprockets that engage the precision engineered wire mesh that retains its dimensions even in fluctuating process temperatures. This positive drive system is better value for the money than chain-edge constructions and offers greater production output, lower maintenance costs, improved product quality and a longer belt service life than chain belts. In order to guarantee correct product alignment and to reduce product damage, the Cleatrac belt and Sprocket system runs smoothly around the smallest transfer diameters in the industry down to 5.1 millimetres. Ashworth’s Omni-Pro belt line introduced to the baking industry in 2005 continues to be one of Ashworth’s best-selling spiral system products. It is currently available in pitches ranging from ¾ inch to 1-1/2 inches. The Omni-Pro belt is the strongest grid type belt on the market today. The increased strength of the Omni-Pro comes from the new 360 degrees button-less weld technology utilizing a “zero tension” design which allows for a higher load bearing capacity. Unlike a traditional bridge weld design used on previous grid belts, the 360 degrees button-less weld is free from surface imperfections and crevices, which improve hygienic characteristics by eliminating the possibility of microbial entrapment. The vastly improved weld design, the patented protrusion leg and the patented coined link design combine to reduce cage bar wear, belt elongation and increased belt life in the most demanding lotension spiral systems. The four belt types already mentioned only give a small overview of Ashworth’s wide range. The product range is con-
siderably bigger and offers not only standard sizes, that can often be supplied within 24 hours, but also a large number of special custom-made items. Although as far as conveyor belts are concerned we wanted to restrict ourselves to four typical examples, we are bound to mention the introduction of the Advantage belt. Introduced in 2006, the Advantage belt offers bakers a hybrid plastic spiral freezer belt that provides superior airflow and enhanced product release characteristics to minimize product damage and reduce energy cost. The combination of the modular plastic conveying surface and stainless steel rods are a well thought-out hygienic design and the only USDA accepted plastic spiral belt available today. Even today, the lotension spiral conveyor system and the associated metal curve belts are the international standard for deep freezing, cooking, proofing and cooling applications. Ashworth’s business is rounded off by its own service department which is available 24 hours a day, seven days a week, 365 days a year. There is a team of experienced staff available for any requirement, whether it is service, system renewal, maintenance, installations or problem solving.

Ashworth Amsterdam

Ashworth’s sales team in Amsterdam managed by Andreas Hofman in order to support the company’s sales and service efforts in the Europe, Middle East and African regions (EMEA). This strong sales team is concentrated on servicing both existing and new EMEA customers in order to build business in Europe and beyond. The Netherlands’ office is supported by a production site in the West Midlands of England, near Birmingham. This factory manufactures almost the same products as in Winchester in order to keep the service quality and delivery times for the EMEA region at a high level. „We must tread the same path as the majority of our customers and position ourselves globally,” said Hofman on the future challenges of the conveyor belt specialists.

Gregor Vogelpohl

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Precision-weight portioning

The Schwarzwaldbrot bakery from Neuenburg in Germany uses a Vemag dough divider with pneumatic cutter for a select range of bakery and confectionery products.

What was initially intended to be a test has long since become daily routine at Schwarzwaldbrot in Neuenburg am Rhein: employees at the company, which is part of Edeka Südwest, have been using the HP 20E dough divider and pneumatic cutter 811 from Vemag for more than 18 months now. Production Manager Udo Bockstahler and his team were so impressed by both systems during the testing phase that they turned the trial period into a permanent working relationship. Since then, not only have the machines been used in the bakery for bread with a high dough yield (DY), they have also been used in the confectionery section, where Stollen and Linz rolls in particular are produced using a combination of the systems. Extolling the benefits of the machine, Bakery Manager André Dörflinger, who has worked within the group of companies for 24 years, said „We added the new system to our product portfolio“. In order to make adequate use of the dough divider, which is designed for industrial applications, items made using the system are not only produced for the 220 K&U branches affiliated with Schwarzwaldbrot, but for the entire Edeka Südwest network, which is interconnected via a sophisticated delivery system. The network consists of a total of five bakeries with around 800 branches and 5,000 employees in all.
Dough divider

The Vemag dough divider is mainly used in the processing of bread. The finished dough, which has a DY of up to 220, is placed into the polished stainless steel hopper, which has a volume of 250 litres, via an elevator tipper. The hopper itself is equipped with a safety device, which switches the machine off when it is open. In the hopper, the filler material is conveyed via the feed screw into the thread of the double screws with the aid of the vacuum. The product feed is also assisted by the stopper coil inside the hopper. The scraper, which is attached to the powered feed screw, can be dismantled for cleaning purposes and reinstalled very easily, and guarantees that the hopper is emptied completely and thoroughly. The applied principle of dividing the dough using double screws differs fundamentally from other well-known methods. The double screws function according to the double spindle principle and ensure that the dough is transported gently and evenly to the outlet. The double screws consist of three segments: the central section with steep incline, i.e. a large gap between the threads, enabling optimum intake of the dough. In the rear section, which does not conduct any product, the vacuum generated by the vacuum pump is applied, and at the front is the narrow, winding portioning section. The vacuum, which can be adjusted to suit the dough, ensures that the double screws are filled evenly and are free of any hollow areas. The same volume is conveyed with each rotation of the screws, resulting in a high degree of weight precision. The speed of the double screws, and thus the quantity of product portioned, can be infinitely adjusted. The dough can be expelled either continuously or in individual portions. If portioning the dough individually, the number of double screw rotations is the measure of the weight of the individual portions. The dough is conveyed within the system and portioned without any assistance in terms of oil or flour. Not only does this make for a significant improvement in terms of cleanliness, it also has a positive impact on running costs. The dough divider is controlled via the easy-to-operate graphic display. Here, the individual programs can be stored with their respective parameters. The user key can be used to regulate access to specific functions. Thus, for example, unauthorised employees can be prevented from making any changes to programs.

Portioning

The pneumatic cutter 811 complements the Vemag dough divider perfectly. The system comes with a protective cover as standard. Schwarzwaldbröt also opted for an integrated conveyor belt. The blade divides up the product flow in accordance with the specifications stored in the portioning computer, upstream of the nozzle. The dough then drops onto the conveyor belt, which is connected to the cutter’s protective cover by two bolts. The shape of the dough piece is ideal for cans or boxes. This means that there is no longer a need for further processing after cutting.
protective cover has a latch on each side, which needs to slot into the groove of the respective bolt. The blade functions with dry compressed air, which must be drawn from an onsite connection. Connection to the dough divider is implemented via a cable, which is inserted into the filler’s system connector.

Cleaning

It is important to note that the Vemag dough divider is very easy to clean with hose water, which was demonstrated to us when we visited Neuenburg. The system was firstly disconnected from the cutter and generally cleared of any impurities. Two employees then transport the dough divider into the wet area using a lift truck. The machine is disassembled into its few individual components without much effort, and using only a few tools. These can now be washed in the dishwasher. This includes the double screws, the double screw housing and the feed screw. The rest of the system can be extensively hosed down using hose water, irrespective of individual components. The hopper is hinged open for cleaning, so that the internal wall is easy to access. And the subsequent reassembly can be undertaken quite easily by one person. Vemag has taken care to ensure that it is not possible to assemble the system incorrectly.
Left photo: When reassembling, the double screws must be reinserted into the double screw housing. They are correctly engaged when the end faces of the double screws and the surface of the housing are at the same level. Right photo: In the hopper, feed screw, stopper coil and scraper improve the filler material feed in the direction of the double screws.

thanks to the specific component configuration. So the whole system is back in place in production, ready for the next job, in less than half an hour.

Overall, Udo Bockstahler and his team are extremely satisfied with the Vemag dough divider. It is possible to process dough with a DY of more than 200, and with a high degree of weight precision to boot. Cleaning the machine with spray water is feasible with no limitations, therefore this is not time-consuming. In addition, no auxiliary agents such as cutting oil or flour are used on the system, which not only reduces the running costs, but also has a positive impact on the baking results due to the exclusion of flour and oil from the dough piece. So in conclusion, the verdict is: „Our new employee is ideal for bakery products that have a fine, uniform crumb texture“, concludes the Production Manager, casting a critical eye over the end products made using the dough divider.

Gregor Vogelpohl
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Linear transport of vats

All the individual steps of dough preparation - from filling to emptying - are coordinated in one controlled process flow.

In industrial dough production, in addition to the kneading process with the relevant energy input, dough handling is also very important. In practice these „sideline steps“ such as dough emptying, dough transport and a controlled dough feed are easy to underestimate and which can result in empty logistics loads, different dough rest times, dough ageing or a skin forming. This in turn leads to fluctuations in qualities and the benefits which were secured through the quality of optimum kneading being partially lost. Automated processes running on specified parameters support the staff who produce the batches of dough. These processes create an environment where errors due to the very labour-intensive and sensitive transport of the kneaded dough can be avoided.

Automation steps

The degree of automation in dough production and the subsequent dough transport are mainly dependent on the required capacity of the plant. Above a dough output of 1,000 kilograms per hour, it is sensible to consider partial or full automation. In a fully-automated process linear transport is the ideal system for batch
dough production. This is where a robot moves the kneading vats to the stations described below. First of all the dough is prepared in the dosing station. As a rule the main components are fed into the earmarked kneader by means of the computer-controlled weighing station with inlet ports in the cover. Depending on the technology used in the dosing station, the small and medium-sized components are either added by hand or by the system. If dough output is small or for space reasons, the dosing and kneading station can be planned on one position station. When throughput is higher, these process steps are separated from each other. In this case the vat is guided along to the kneading station where the dough is being kneaded according to the recipe. After this station the dough rests for the necessary period in a position specifically designated for this purpose. Once the fermentation time has expired, the dough must now be filled via the elevator tipper into the dough divider of the line. The vat is then cleaned in the cleaning station and the process can start all over again.

**System features**

The different system components must be fine-tuned to each other in the planning stage when a new system is being designed or an existing system is being renewed in full or in part. In an automa-

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Backtechnik - international

In an automated dough preparation system all the individual process steps from the kneader to dough resting and then dough emptying must be planned to make the best use possible of the available space and all the required steps must be mapped. A high degree of flexibility is achieved by the robots, which can place the rotating vats on all four sides of the main support stand. The system capacity has been designed to output up to 16 batches per hour. This equates to a dough capacity of up to 6,400 kilograms.

The consideration of different rest periods within the same system continues to be important as is the possibility of discharging into several production lines simultaneously. The vats are transported with the linear transport robots. The robots can move over four axes and push the vats forwards and backwards. The vats are anchored in the cradle and moved between the individual stations. During transport the cradle lifts up and has no more contact with the ground. When it has reached its destination the cradle lowers and the vat can be pushed with the telescopic output into the station or it can be taken out again.

Controlled on request

The system automatically generates the necessary priority of

Left photo: Once fermentation is complete the linear transport system transports the starter doughs for further processing at the next station position. Right photo: The systems are subject to extensive function testing at the plant in Osnabrück and are then delivered to the customers.

Left photo: In an automated dough preparation system the vats are moved between the individual stations via a customised transport system design. Right photo: The linear transport system is secured with light barriers against unauthorised access. The processes are controlled via the galleries.
movement routines. In a normal sequence first of all the dosing station is emptied, then the kneading vat moves to the kneader and then into the elevator tipper. If there are any deviations in the recipe sequence, the robot decides, based on the programmed instructions, which requirements are to be fulfilled first. Primarily when a dough rest time is desired then this always takes precedence. The sequence logistics of the robot always „looks” for optimum capacity utilisation. Unnecessary vat movements and empty runs are avoided. This not only protects the dough in the vat but also relieves strain on the whole system. The speed of the robot with the kneading vats is orientated to the content and aggregate status of the doughs. These are the necessary standards for a smooth and effective process flow. This means that when the vat is to be brought from the dosing station to the kneader, the system moves more slowly than from the kneader to the elevator tipper. This can be interrupted feasibly at any time and the program will then recommence normally at this point. This is possible in the event of the manual addition of ingredients, removing a defective batch or cleaning the kneading vats during the production process. The recipe management specifies, and with exact sequences, when and how the individual stations such as the kneader, dosing station or elevator tipper are stopped at. This prevents false steps and routine errors occurring. The precise adherence to the dosage and kneading steps together with the precise rest times are important requirements in this sort of automation process. So that the information is always visible and reproducible, batch traceability is required. The tracking system with its process data such as time, temperature, energy and rest times for each batch in connection with the monitoring of production in the overriding production management system (MES), is an accurate analysis of the production process. This is the basis of a traceable, verifiable, consistent and effective quality control.

Automated and computer-controlled process flow

An automatic and computer-controlled system sorts out complex and recurring processes. This takes place completely independently from external influences and can therefore prevent human routines causing errors. This enables consistent product quality with a longer shelf-life to be achieved. However, this is accomplished with a flexible and customised intervention option of the operator that can influence the process flows via the control parameters. The goal is stable product safety at the highest level of quality and efficiency with the traceability of the production process.

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Laminating technology redefined

The C1 process from Codex by Rondo is a new procedure for producing flaky pastry, puff pastry and croissant dough, in which the dough is extruded and a continuous ribbon is directly transmitted to the laminating line.

The Codex test system has been set up in the Technology Transfer Centre in Bremenhaven. The benefits of the C1 process can also be seen in the production of butter croissants as this configuration enables both a shorter production line and a reduction in production costs. The managers at Codex deliberately chose a croissant line as the quality criteria of this breakfast bakery product are very varied and which include a flaky, tender crumb, a golden crust, the consistent leavening of the bakery products and the pleasant butter taste. In order to consistently ensure these features in conventional line production, precise knowledge of the production processes and compliance with the relevant production parameters are required. This applies in particular to the processing of butter which is very demanding. Industrial systems for the production of butter croissants are therefore large in size and complex and have at least two fan-folding stations and a long cooling and resting route.

During the development of C1 process, we considered in great detail the dough properties with which we would achieve the best laminate result. Therefore we discharge the dough ribbon directly from an extruder onto the laminating line. In our extruder we generate dough properties which enable us to pur-
sue new avenues in the production of laminated doughs. In this way we can radically reduce the processing time as well as the length of the line since in the C1-process the second fan-folding station and the complete cooling and resting route are no longer required" says CEO Christian Becker-Sonnenschein when explaining the new method.

The extruder

In the Codex extruder the ingredients are mixed by two counter-rotating screws and then the dough is continuously discharged through a nozzle. The downstream laminating line is fed directly with this continuous dough ribbon and in this regard the Codex extruder differs from other kneaders which are unable to produce a homogeneous, continuous dough ribbon and therefore must always be fed with a dough band former, which also serves as a buffer store. The ingredients for the croissant dough are fed into the Codex extruder via a fully-automatic metering system. This ensures a precise and reproducible dosage of the individual components which is extremely important for a continuous production process. First of all the dry components (for example flour) are metered into the cylinder of the extruder which contains two counter-rotating screws which operate using the force-convey principle to transport the dough from the mixing zone to the nozzle and which achieve high conveyance efficiency due to their specific geometry. In contrast to the counter-rotating screws commonly used in the food industry, the rotational speed of the screws can be signi-
significantly reduced here. The liquid components are then added. One of these ingredients is for example water which wets the dry materials with two high-pressure nozzles from the top and the bottom at high pressure. The extremely high pressure of the water causes differential mixing as it is called by Codex. The extremely fine water and flour particles are mixed together homogeneously. And since the surfaces to be wetted are very large, the flour absorbs more water than in the case in traditional kneading processes. After the addition of other components the dough is now exposed to severe overpressure. The aim of this measure is to achieve a considerable increase in the air bubbles in the basic dough. These expand its volume when the dough is exposed to a vacuum in the next process phase. The dough is still kneaded and moved forward until it reaches the nozzle. In this phase the large bubbles divide up into countless smaller ones. The dough is now completely plastic and this dough plasticity enables up to 30 layers to be produced on one fan-folding station for the first time. Previously the limit was ten to twelve layers, since the elastic properties of a conventional dough did not allow for a greater degree of rolling.

**The croissant line**

After the extruder the laminating and the croissant production take place on the laminating line. However, a production line with the C1 process differs significantly from a conventional production line in that the extruder discharges the 600 mm wide dough ribbon of uniform thickness directly onto the laminating line. Then butter is discharged onto the dough ribbon with a fat pump, mixed in and rolled by a satellite. When the dough now unfolds is the biggest difference in a process which generates the desired number of 24 dough-fat layers for the croissant dough. This is only possible because after the C1 process the dough has these plastic properties. After the fan-folding and through another satellite head, the dough ribbon is rolled without any damage occurring to the dough/fat layers. After calibrating to the final thickness triangles are cut automatically and these are wrapped into croissants. This marks another special feature of the C1-process, because the dough has lost its plastic properties and regained its elastic properties, which we need to produce the usual pastry products. How can that be explained? At the start of the process the dough has, in accordance with the C1 process, many extremely small air bubbles which cause the dough to conduct itself plastically. During processing on the line, the dough is exposed to ambient air and ambient pressure which causes the extremely small air bubbles to merge together again. The dough therefore regains its usual elasticity which is needed for the proving and baking processes.
Specific features

The preparation of a dough ribbon with the extruder in the C1 process differs in many ways from the traditional mode of production. We have already addressed the lower investment costs on the laminating line, where due to the plasticity of the dough ribbon, individual work steps with the corresponding components are not required. Also to be highlighted is the good process control and security in the extruder, which is reflected in the permanent cooling in order to obtain a defined dough ribbon. In conventional applications the production room is specifically cooled in order to create optimal conditions. No ice for dough cooling needs to be added in the C1 process. A sensor in the nozzle measures the dough temperature and automatically regulates the cooling. For Clean in Place (CIP) the cylinder is rinsed and cleaned with water and detergent. The water can be warmed up to 80 degrees Celsius which enables the easy removal of milk and egg and through the good plastic properties of the dough ribbon, a reduction in process flour can be achieved. Just the costs of auxiliary materials and consumables are often neglected in the continuous process, even though on closer examination in 24/7 production they are often not inconsiderable. As is usual in modern processes it is also envisaged that dough remnants which remain after cutting can be reprocessed. The C1 process is flexible since with a suitable metering system the ingredients for different recipes can be fed to the CODEX extruder. Recipe changes are possible without much effort. When the recipe is changed without cleaning the extruder, the new dough simply pushes the old dough out of the extruder. The mixing of the two dough types is extremely small. Tests have shown that less than 30 kg waste is generated. The flexibility of the line enables doughs with different recipes to be produced and with different properties without the screws having to be exchanged. These properties of the C1 process offer another big advantage in that the CODEX extruder can stop itself for instance in the event of problems on the packaging line, and easily restart, without any dough wastage ensuing. This is a difference in relation to previous solutions with continuous kneaders. Interested experts can examine the new procedure at the Technology Transfer Centre in Bremerhaven where the first test line with the C1 process has been built together with Becker-Sonnenschein.

Gregor Vogelpohl

After baking the butter croissants have a silky, shiny, golden crust, a smooth flaky pastry and a tender crumb.
Baked goods are coated with many different types of product in large modern bakeries. Glazes, fondant, chocolate, castor sugar or even seeds give products an attractive appearance. In addition a crispy sensation in the mouth is created increasing the taste experience. A powder can only be applied together with a liquid so that it stays on the product. There are many different ways of doing this: trickling over the surface, dipping the product, spreading with a brush or felt or spraying. The technique here depends on the application, i.e. what liquid is applied to which product. We can differentiate two types of application here: One is necessary for the process or product quality and the other provides a welcome addition to the product features. Every application has requirements that could cause quite a headache when it comes to implementing them.

**Necessary applications**

For many baking companies the application of releasing agents to baking tins is a only necessary evil as this process step does not create any added value but is only to prevent having to stop the machinery when releasing the product from the tin. If grease or something like that is used it’s always a mucky procedure regardless of whether it is applied with a brush or by spraying. A thin separating layer is used if baked goods are made from ingredients that do not mix in the long term: Cream on baked pastry soaks through the crispy lower layer in just a few hours or, at the most, a day. A mixture of different fats or even chocolate is often used as a separating layer. Here dosing and precision are required in order to ensure even...
protection without the coating flowing over the rest of the cake.

**Supplementary applications**

There are other requirements too with a liquid egg glaze. It gives a croissant or a brioche a shiny surface. The liquid egg must be cooled to prevent the growth of bacteria. When spraying there is a certain amount of overspray that does not reach the product and must be collected. On contact with air the liquid egg is inclined to turn to foam or to dry out which can cause disruptions in the process. Coating biscuits with oil first of all enhances taste, improves the distribution of flavours (flavourings are frequently fat soluble) and stabilises the surface of the biscuit. A frequently used technique to apply oil is to use a turntable with the oil connection in the middle. The oil is distributed by centrifugal force. This has advantages: it is a simple, robust procedure that is also suitable for oil containing solids (salt or spices). Disadvantages are an unwieldy machine, high maintenance costs, coatings applied unevenly. Also excessive mist is generated because of the impact energy. Great care is needed with flavourings used are volatile because they consist of light molecules and a water alcohol solution is used as a carrier. A certain amount of alcohol not only contributes to the taste but is also used as a preservative and keeps the pastry soft. The product's shelf life is increased. The dangers of dealing with alcohol mixtures and the necessity for precise dosing are obvious. Careful application is recommended. Very often chocolate is spread on baked goods because this appeals to children and grown ups alike. Preparing, handling and spreading chocolate products has created a whole branch of industry with mechanical engineers and manufacturers of baking ingredients. The most common procedure that people are very proficient in, in spite of it being complicated, is chocolate coating in which the baked goods go through a curtain of tempered choco-

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Left photo: The stainless steel spraying bar has been specially designed for food use. Right photo: At cake with layers of varying moisture by spraying a separation layer for the separation of the individual layers are applied.
late and the excess is blown away. In some cases this technique cannot be used either because the products are too big or because only part of the product (normally the top) is to be covered. These examples of use explain the complex requirements for spraying systems, such as exact dosing, even surface structure, homogeneity and consistency of the spray medium and all this has to be taken into consideration while complying with hygiene requirements.

Answers

The latest advances in spraying systems have created very promising applications that provide solutions for the problems described. For some years now there have been those who favour significantly increasing the number of outlet holes used, i.e. the nozzles, in order to reduce uneven dosing, uncontrolled distribution, overspray and misting. Liquid and spraying pressure are reduced in order to reduce the shearing and impact forces. Also smaller nozzles were inserted into smaller spray guns. Miniature spray guns are so light that they can decorate biscuits when they are fixed to robot arms. In addition the number of movements per minute was increased. Another breakthrough was the introduction of the automatic Pulsajet gun. The gun performs 10,000 operating cycles a minute. Also the time that the nozzle is open during the operating cycle (compared with the closed status) can be controlled. The procedure is called pulse width modulation (PWM). First of all the liquid pressure is set so that the required spray characteristics are created. Then the dosing is controlled precisely using PWM. This is done by setting the nozzle opening interval to between 100% and 1%. Another advantage of this is that the electronics can be programmed in such a way that the spraying system always adjusts to the fluctuations in machine speed during production. The automatic Pulsajet spray gun is suitable for the aforementioned applications when the viscosity of the liquid is less than 250 mPas (millipascal seconds), which applies to most spray media with the exception of gels or chocolate. The liquid can be heated to reduce the viscosity. The traditional air mist spray gun can of course be used for chocolate, sugar syrup, fruit jelly or liquid fondant icing. But a process is not only made up of a spray gun. It also includes the supply line for the medium to be sprayed. Progress has also been made in controlling the liquid supply. The viscosity and also the temperature have the greatest effect on the spray characteristics. Special improvements were necessary to ensure that the product reached the spraying point at the right temperature and also that this temperature is maintained throughout the length of the pipe: flexible pipes with a heating jacket (hot water), heated nozzle pipes, recording and monitoring pressure and temperature.

System solutions

In order to ensure that the liquid is applied in the correct way for the product, attention must also be paid to the spray mechanism and the liquid supply pipe. Both must be connected to a continuous system. The solution to the problem begins by ascertaining the product features that determine the type of nozzle. The optimum arrangement and parameters can be analysed in pilot systems. The scale can then easily be increased. The shape, dimensions, position and movement of the product determine how the spray guns and nozzle pipe are to be set up so that the desired spray pattern is created. The production conditions and environment are also allowed for: Systems are adjusted to cope with running times, changing recipes and cleaning procedures.

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Laic Denoyelle
Food Process Engineer

Backtechnik 02/2013
At the International Baking Industry Exposition (IBIE), the industry comes together like nowhere else, attracting baking professionals and exhibitors from around the globe. Held in exciting Las Vegas, IBIE features thousands of the newest products and technologies and provides the full range of equipment, supply and ingredient solutions to help you stay competitive and strong in the changing global marketplace.

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Kuchen-Peter is based in Hagenbrunn in Austria and with its annual production of more than 33 million doughnuts, the company is one of the leading producers of the popular yeast-based pastries. In the past pastries were produced on three lines in order to meet demand - in particular in the season from September to Ash Wednesday. However, after an operating life of over twenty years the systems were getting on a bit and replacement investments were necessary in order to adapt quality and quantity to current standards. After intensive discussions and careful consideration, Managing Director Peter Györgyfalvay decided to move away from the previous suppliers and start working with processing technology from WP Kemper. The first system equipment combination consisting of the Softstar Plus dough dividing and rounding machines and the Evolution doughnut system was delivered in 2011 with the second investment in an almost identical line following a year later in August 2012. The two new equipment systems can produce almost the same quantities as the three old lines. Kuchen-Peter with its 320 employees in 24 hour production also produces pastries, mixed and speciality breads, patisserie and confectionery products. In addition to its strong position in the doughnut market, Kuchen-Peter has also acquired a good reputation in Austria as an organic baker.

Doughnuts from Austria

Kuchen-Peter from Austria has invested in system equipment Softstar Plus and Evolution from WP Kemper for the automatic processing of its doughnuts.
Dough dividing and rounding machines

An elevator tipper is used to move the yeast doughs for the doughnuts into the Softstar Plus hopper which accepts 160 kg dough in the standard model. Integrated into this model is the TT pre-portioner with its own drive which has proven its worth with high hourly capacities. The dough is released by a contactless pulse generator. The system’s measuring and moulding drums ensure that the common weights of 35 to 50 through to 70 to 90 grammes can be produced on both systems. Continuous dough input is supported by three rollers arranged in pairs. The adjustable, sensor-controlled dough dividing system with its infinite number of settings adjustments means that different dough consistencies can be handled with care. Oiling the measuring drum further facilitates the release of the dough pieces from the measuring flask, thereby ensuring a high dough yield. On their route from the measuring drum to the moulding drum, the dough pieces now on the resting belt pass through a flour dusting device or alternatively, a hot air blower before they are intensively moulded into round shapes. The moulding drum is one of the key elements of the dough dividing and moulding machines. In contrast to Softstar, the moulding drum mounting of Softstar plus is equipped with an additional stabilising counter-weight. The dough pieces are now transferred to the robust link conveyors which move them to the indexed and pivoting conveyor. The dough dividing and rounding machine is operated via an integrated SPS control panel with a touch screen display. Different machine parameters such as hourly capacity, moulding revolutions, flour duster, dough weight, moulding pressure or dough pressure can be programmed and stored in the recipe control management with 30 memory locations. Also included as standard equipment is an electronic piece counter, an hourly capacity display and an infinitely adjustable drive.

Doughnut System

On the indexed and pivoting conveyor the row capacity of the head machine is doubled, in this case from five to ten units. First of all the indexed and pivoting conveyor in its base position picks up a row. Then the entire table pushes forward a defined distance and the dough pieces from the next row can be positioned at the relevant spacing. A first pressure roller presses the round dough pieces so that they increasingly take on the shape of a doughnut. So that dough pieces are transferred...
smoothly to the kneading trough of the proving and stiffening station, WP Kemper aligns the moulded dough pieces with a corrective device. Flour dusters add potato powder to the kneading trough before the input station of the final prover. To better monitor the fill level, a warning signal is displayed in the display. Two rap-pers ensure that the separating flour is distributed on the dough pieces promptly, consistently and finely on the kneading trough and before the pressing station. More than 1,000 proving trays are built into the system. They have an internal width of 105 millimetres and are equipped with an exchangeable cotton lining. The total cycle period for the dough pieces, which is divided into proving and stiffening time, is about 90 minutes. Here the moulded dough pieces are again turned and pressed in the pressing station of the proving zone, in order to improve the quality of the doughnuts. The pressing takes place before the dough pieces enter proving zone two of the proving chamber. First of all the doughnut dough pieces are discharged, turned and dusted with potato powder. Then they move through the pressing station which consists of a height-adjustable pressing table arranged above the discharge belt as a synchronous belt. The required distance between the two belts can be adjusted by hand wheels. The spacing position can be read on the scale display. Here, too a correction device is connected in order to transport the dough pieces into the kneading trough. Once the second proving phase is completed, the products move into the stiffening zone where the priority is the stabilisation of the dough piece surface. Finally the dough pieces are placed on the discharge conveyor belt and transported through a narrow opening to the baking tray. The transfer to the next station is continuous and with clearly defined row spacing. The climate-control technology crucial for product quality was also sup-

**Kuchen-Peter**

Innovative Backwaren.

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Left photo: The dough pieces pass through a lamella curtain out of the stiffening zone and are moved from the discharge belt to the baking tray. Right photo: The baked doughnuts can still drip a little before the relevant fillings are injected.
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Backtechnik visited Mecatherm, the French manufacturer of ovens, machines and automatic production systems for industrial plants at their factory in Barembach. In an interview the Chairman, Bernard Zorn, talked about the current position on the global market and future trends.

Backtechnik: With our first question, let’s look back to the past again, to IBA in Munich. Were your expectations of the Weltmarkt des Backens (Global baking market) met?

Zorn: IBA was a great success for our company. Particularly because the exhibition in Munich resulted in concrete orders. Here a whole year’s work paid off. First of all we had very promising talks with customers at the Europain exhibition in Paris. We were able to firm these up at the Weltmarkt des Backens and then bring them to fruition.

Backtechnik: Large exhibitions are seen as trendsetters for the industry. Did you notice any developments that we will have to keep up with in the next few years?

Zorn: In our opinion there is one development that we will value highly, industrially manufactured products. In the past you could easily tell the difference between industrial products and baked goods manufactured by hand in small, good bakeries. That is no longer possible today. The industry has occupied a segment that is still not quite up to the quality of good artisan bakers but which is coming closer and closer and at prices that we expect from mass produced products and which a wide range of customers is prepared to pay. Mecatherm has positioned itself precisely in this segment and developed machines for it.

Backtechnik: You will cope with the trend for variable high performance machines with the Bloc Combi. What was your intention in develop-
ping it and how is this line being accepted by the market?

**Zorn:** The idea behind developing the Bloc Combi unit was to supply countries where consumption of baked goods was increasing with a system that was highly variable. Often in these „emerging countries“ the trend towards a product group is not clearly discernible and investing in a single line is too risky. With the Bloc Combi unit our customers are in a position to produce both bread for toasting as well as baguettes and small baked goods in high numbers. And so, for example, the hourly output for bread for toasting that is produced by the four piece method and then twisted is about 4,000 units. With the knowledge gained about the market, companies can then invest in single lines after a few years.

**Backtechnik:** Will there be further interesting innovations from Mecatherm/Gouet in the near future?

**Zorn:** If we want to look into the future first of all we must look back to the past. At Mecatherm we have always been busy developing new products and processes and we have had a massive impact on some trends in the last few decades. Thus in 1985 we developed the first machines to produce dough on an industrial scale and then we devoted time to manufacturing semi-baked products. We want to take this up again in the future and face up to future trends or even set them ourselves. In this respect you can expect still more from us: Wait and see.

**Backtechnik:** What countries are currently particularly interesting for you from an economic point of view and where do you still see potential?

**Zorn:** We see a great deal of potential still in the Arab countries, in Africa and undoubtedly in South America. Here development in the field of industrial baking technology is not yet very well advanced and for this reason there is still a great deal of demand. And we mustn’t disregard Asian countries. Here development is no longer so fast because the initial trends have taken hold and the latest investments are being made very cautiously. China has already reached a good standard. Here we still see options for selling machines as a result of the development of a strong frozen products market. The whole country can then be supplied with the products manufactured there.

**Backtechnik:** You have just touched on the economic development in individual countries and regions. How is the trend developing with the familiar product groups?

**Zorn:** In the last 50 years we have been detecting a development towards small, low weight products. Whereas earlier the main product was uncut bread weighing one kilo, we are now seeing a trend towards small baked goods weighing 60 - 80 grammes. And even loaves are typically being offered cut in order to be able to supply small units. This development will be followed and reinforced of course, particularly because of changing eating habits. Meals are often no longer taken at home with the family but bought and consumed outside the home.

**Backtechnik:** On the other hand, with some projects you are” We provide systems for our customers that produce products with artisan quality in industrial quantity. “
increasingly having to deal with financial investors who have no experience of the baking industry. To what extent does this influence how you deal with the technological side in particular?

**Zorn:** With many customers from the „emerging countries“ we are duty bound not only to supply a system from processing up to freezing - which is of course our core skill - but our job goes further than that. Dosing, kneading and packaging are other components of a functioning production facility for which we must also be responsible. On the other hand, European customers have a much more targeted approach. They are very well prepared and already have a very clear idea of the amount and type of investment. Here, of course, the many years' experience in industrial baking technology that these customers have gained plays a part.

**Backtechnik:** Last year you sold out to the French financial group, Wendel. What effects did the change have on your company?

**Zorn:** We are very happy with this development and remain a shareholder, although to a lesser extent. Wendel is a family organisation that is very well established and offers our company long-term prospects. We currently assume that Wendel will be committed for at least 15 years and not like many financial investors, just try to maximise profits after two or three years in order to sell the company off again. That therefore gives our Research and Development department time to work on long-term projects or even think about buying companies in order to make perfect additions to our portfolio. You actually need time to integrate a new company, as we found out from our own experience from the purchase of the Gouet Group in 2006.

**Backtechnik:** Another important topic is energy and its consumption. What action have your designers taken to reduce consumption?

**Zorn:** With regard to energy we have two aspects that are particularly important to us. Firstly, in the parbaking phase we want to remove as little water as possible from the product but also want to achieve a strong framework. Even the costs of heating water in baked goods so that it evaporates are extremely high. Less loss in baking obviously means more water in the baked goods and therefore they keep fresher longer. Secondly we place a great deal of importance on the controlled addition of steam. Any superfluous litre of steam that goes unused, with the corresponding heat, through the pipes into the chimney is very expensive. Mastering this process can greatly reduce energy costs.

"Mecatherm for nearly 50 years focused on the production of equipment for industrial baking technology."
Backtechnik: When customers and business partners visit your company here in Barembach the experimental baking room catches their eye immediately. What advantages does this facility provide you with in your daily work?

Zorn: The first point is that each first machine of a newly developed range is assembled by us and gone over with a fine-toothed comb and then also remains here in the company. The majority of mistakes are therefore made first of all here in the factory and not at the customer's. Another aspect is that we can use the machine for training purposes. This applies to bakers, engineers and sales people who all need precise information about the machine in their special area and then they can implement it here in practice in the factory. Thirdly customers can test the line and the baked goods manufactured with it with their own ingredients and recipes. Sometimes a large quantity of the baked goods goes to new markets in a container in order to test consumers' acceptance. The 4,000 square metre hall offers many possibilities here. Thus baked goods can, for example, be baked in four different types of ovens to select the most suitable system for the product.

Backtechnik: Miwe is a company that has started constructing large ovens. What is your future strategy?

Zorn: We have very great respect for Miwe, which we consider to be a very good company. But we are also convinced that you have to concentrate on one area in order to be successful. You either design and build ovens for industry or for artisans. To operate successfully in both areas will become more and more difficult in future. We have dealt exclusively with industry since we were founded in 1964, almost 50 years ago. This was often not very easy at times when the global economy was in crisis, as in 2009, but we are looking very positively to the future with our new developments.

Interview conducted by Gregor Vogelpohl.
When Bäckerei Büsch, part of Edeka Group, built its new production hall it also invested in intralogistics for small bread roll metal trays and transportation crates. These already existed in the company and the objective was to integrate the baskets and trays into the new system. As if powered by magic the individual crates and stacks now move along the conveyor belts at the bakery and onto the production line. What appears at first glance to be so very simple and straightforward, is on closer inspection the result of intensive planning and development work being done by the CIC GmbH from Darmstadt. During our company report we specifically followed the route of the bread roll trays from the buffer store through to the picking phase. In spring 2011...
Komatec Maschinenbau GmbH, founded in 1992 and located at Enkenbach-Alsenborn near Kaiserslautern, was commissioned to install an automated system with standardised procedures in order to generate a more consistent quality of production. Well thought-out and proven modules complement these special designs which have been customised to the individual conveyor belt system. Production manager Franz Josef Conen and Bäckerei Büsch are pleased with the result. With over 100 branches and more than 500 employees, the bakery founded in 1987 by Norbert Büsch is now one of the leading bakeries in the Lower Rhine region in Germany.

Trays

The entire tray logistics system transports well over 60,000 baking trays and it is important that the system does not run out of trays and that there are always sufficient empty trays in the bread roll system to fill with the dough pieces. For this reason a buffer store has been installed in the bread roll production line which can stack up to 10,000 empty baking trays. Their storage and retrieval is performed by a gantry robot with an integrated grabber which transports eight trays at a time. Immediately after this station is the first built-in switching point. One route transports the baking trays directly to the tray stacker where they are placed on the top of the stack. When the incorporated small buffer is empty, the system control system requests new trays which refill the store. The second route transports the trays to the bread roll line. Before adding the dough pieces the baking trays have to be lined with baking paper which is sucked with vacuum grippers pre-cut from a hopper and laid in the four trays which are positioned on the conveyor belt. The metal trays now move along the conveyor belt and reach the bread roll line. A removable belt positions the dough pieces in the pre-specified layout onto the baking paper and the trays now move forward to the stacker. A tray...
without paper forms the top of the stack. It serves both as hygienic protection against contamination and it also prevents uncontrolled airflow on the dough blanks. Including the top tray the stack consists of 35 baking trays. At the same time two trays are placed in the tray stacker and the individual trays are always pushed up from below. In order to secure the next transportation phase of the stack which now weighs between 80 to 90 kg, a strap similar to the ones used in packaging, is pulled tight around the tower. The next route now leads the stack to another storey. The new building has three storeys which are interconnected with lifts. One lift can transport two stacks at a time and has therefore been designed to withstand loads of 200 kg. In the middle level the stack is initially guided towards the proving chamber. The temperature and time spent in the proving chamber are pre-specified in the system controls. Currently about 850 trays can be processed per hour. However, a second track has also been installed within the proving chamber which can be used when higher capacity is required. The stacks then pass through the shock freezer into the storage freezer. This is so large that an item can be stored there for a week. Of course this high storage capacity has an immediate impact on production which can now be run more efficiently. Currently on average still only two item types are produced per day which greatly reduces set-up costs on the bread roll production line. Picking then requests the items. The system has been programmed so that it is not one product type that is totally removed from the store but one stack. This ensures that the different items in the fifteen available rows in the picking section are all in a consistent condition. Stacks which are no longer complete do not return to the storage rows where the item is kept, but are parked on a belt to then be taken out of the store as a priority on the next request. Two shuttles and chain conveyors move the stacks in the deep freeze store and transport them to their positions. A specific position is provided for each dough piece type in the distribution. Mobile forklifts with insulated containers then drive to the corresponding positions with the lifting stations and the trays can then be stacked in the insulated containers.
Crates

In addition to the logistics for the small bread roll trays, Komatec was also responsible for the crates logistics. Here too at the start of the process is a large empty crate store where the crates are kept. The baskets are unstacked and guided through the many branches of the system to the individual packing stations where they are filled with goods. One of essential pre-requisite conditions here is that there are always sufficient crates available at the individual stations. In the same way as the bread roll trays, the entire system is laid out over several storeys interconnected by lifts. Before transporting to the other level, the crates are stacked to increase efficiency. In the pre-planning stage both systems require precise knowledge of the goods and quantities that will be transported.

By CIC recorded and processed data were the basis for the targeted program the controller by comatec. The clearly-structured control system enables the plant capacity to be well-utilised and the 3D spatial planning set up by Komatec was another helpful aspect in the design and visualisation of the projects. This provides a detailed overview of the individual components of the project and their interconnections and can help to identify areas of concern. Komatec provides Büsch with ongoing remote maintenance and this enabled from the very outset plant operations to be optimised even more.

Gregor Vogelpohl
Better Hygiene

Brück GmbH & Co. KG from Bad Camberg, Germany, develops and installs suction and disposal equipment for the bakery industry with the prime aim of increasing cleanliness in companies.

Any incidental residues in bakeries may not only negatively impact the production process on the conveyor belts but, in certain circumstances, also the end product. Help is at hand here from the high-performance suction and disposal equipment built and sold by the mechanical engineering company Brück from Bad Camberg. The company dates back nearly 90 years with the suction technology being first integrated into company operations in 1988 and disposal technology in 1995 by the current managing director Thomas Brück. “Since then we have been able to offer everything from a single source - from the point of entry through special cyclones to the disposal system” says Brück explaining his company philosophy. This idea seems to have been well accepted in the food industry since now 90% of Brück’s work involves this industry segment and its customers include many well-known and prestigious large bakeries.
Sliced Bread

Increasingly loaves of bread, bread rolls, cakes and buns are delivered to the food industry already sliced. And it is precisely when oil is also used that clearly noticeable deposits occur which can lead to impairments. In order not to disrupt the production process and pack goods so that they are residue-free, end slices, crumbs and defective products are to be sucked away and disposed of as far as possible where they occur. A task that was already solved in many other industries of the company Brück. Whether paper, wood, plastics or metals, the plants reliably remove chips, dusts, fibers, edge sections and production waste from production. And now the exhaust systems are also successfully used in the baking industry, including cutting machines of the GHD Hartmann from Delbrück. A slicer operates as follows: Both end slices of the loaf of bread fall immediately after slicing into a hopper located inside the slicer and they are immediately sucked away from there. Crumbs which occur during slicing and which fall to the left and right of the cutting point into the hoppers installed to catch them are then are disposed of via a pipe system. Crumbs which the slicer transports upwards fall onto a rounded vibrating tray with a vibration motor and are eliminated there. As a final measure the bread can also be sucked away on the surface to remove the last of the crumbs. When the circular slicer is in use waste slices also fall immediately into the specially positioned hopper and in certain circumstances baguettes sliced into individual slices which do not meet the desired standard or norm are also disposed of here. Accordingly the capacity of the hopper and the connected pipe is designed by the project manager in order to ensure that every slice is caught by the air flow. Two suction devices above and below the circular slicer suck away any crumbs. In addition to the components described most systems have a manual feed installed into which end slices or complete loaves of bread can be thrown and pneumatically disposed of. Other options for the customer are to commission complete disposal, re-use of the bread residues in a bread mixer or a combination of both. In all cases the bread residues are initially fed into a cyclone separator which separates the product and the air. The transport air is discharged upwards through the central immersion pipe, processed via a filter system and returned one-to-one into the existing cycle. For the bread residues discharged in the cyclone over the underlying product outlet, the opportunity is provided to first of all detect them, then
to rip them into smaller pieces in the bread residue crushing system and then to feed them to the re-use or disposal systems. “We have successfully implemented our idea for improving hygiene conditions in bakery companies” states Brück. This statement is corroborated by the many installations in well-known industrial companies and which are increasingly using these systems in clean rooms.

For these specific conditions any design and construction focuses on using as few parts as possible in the clean room and with only one pipe connection to the downstream stations outside the clean room. The reward for these efforts is not only a significant reduction in the cleaning required of the cutting system, but also the creation of a closed system which does not transport the bread residues on open conveyor belts.

**Portfolio**

In addition to the suction and disposal of bread residues, Brück also offers other solutions for the bakery industry. A perfect complement to bread cutting machines is the suction of the oil mist which occurs when cutting bread in the cutting room and when combined with the crumbs leaves a film behind that is very difficult to clean. A separate system sucks away the oil and it is

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Managing Director: Thomas Brück
Founded: 1929

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Left photo: The photo shows the CAD planning of a suction system for flour and flakes in a dough processing system including a feed system with a vibrating screen. Right photo: Removing dust from laminating systems considerably improves ambient air in work rooms.

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The suction hoppers in a circular slicer cutting machine are positioned above and next to the knife.
then captured and eliminated in a special filter system. Not dissimilar to bread cutting are the tasks to be performed in the packaging machinery sector where material residues such as paper, plastic or films from the production process also have to be removed and disposed of. Suction systems can also be used when flours grains or seeds are being used. Examples of this include dough preparation, laminating lines, sprinkling stations and the cleaning of trays or panels. To increase overall hygiene in the company Brück recommends the installation of a vacuum cleaning system. “In many cases employees still have periods of free time after completing their main tasks when they can take care of general operational hygiene issues. Our vacuum cleaners can be connected in different places to the relevant pipes and can then be used immediately” says Brück explaining the simple principle. Given that the company manufactures a large part of the equipment it installs itself, it is able to offer special purpose engineering as well as off-the-peg solutions. “Of course it is always easier to be involved in the early planning phases of new building projects, but that is generally not the rule. When it comes to hygiene area a lot of equipment is retrofitted and then we are able to call upon our customised capabilities and our many years’ experience in system design and construction” explains Brück who sees a positive future for his company.

Gregor Vogelpohl
Robots in the food industry

There is an enormous need for automation in the food industry and it goes far beyond the familiar applications of packaging and loading pallets.

The term Robot surfaced for the first time at the beginning of the 20th century in the drama „R.U.R. – Rossum’s Universal Robots“ by the Czech artist, Josef Čapek. It was derived from the Slavonic word, „robota“, meaning work or forced labour and „robotnik“ meaning slave. From this drama on robots have inspired men’s fantasies, as evidenced by the wide range of science fiction literature and films based on them amongst other things. Although today we can only look on in amazement at the developments in the field of robots, we are, of course, still far from the visions of this genre. Today robots are basically no longer new in the food industry. However, if they were originally used primarily for heavy work here, pioneering advances in different science and technology disciplines led to their fields of application expanding very fast today and robots are being entrusted with more and more demanding tasks.

Automation

If a company is considering automating a recurrent task,
first of all it must be clarified whether this plan is sensible and what approach should be taken to achieve this. The certain but not definitive criteria listed in Figure 1 provide help in answering the first question. Should an automation project appear to be sensible as a result of these considerations, this doesn’t mean that it is feasible too. A pre-requisite for this is that the process concerned must first of all be algorithmical, i.e. it must be clear what is to be done. Secondly it must be possible to enter the required parameters with technical means, which means that suitable sensor technology and the associated evaluation algorithms must exist. Finally the processes to be automated must be repeated so that automation is economically worthwhile. Both machines and robots are available to perform the automation process. In accordance with DIN 19233 these machines are independently operating artificial systems whose behaviour is determined either step-by-step by pre-set decision rules or on a continuous time basis in accordance with set relationships and whose output parameters are created from input and status parameters. On the other hand, according to the definition of the Robot Institute of America, robots are programmable multi-purpose handling devices for moving material, workpieces, tools and special equipment where they can be used flexibly and for different tasks because of the freely programmable movement sequence. And it is precisely because of this flexibility that robots also meet the requirements of small and medium-sized food production companies which are characterised by many different types of task and numerous batch and product changes. The essential advantages and disadvantages of the two automation options can be found in Figure 2. According to a statistics of the International Federation of Robotics (IFR) in 2012 some 160,000 new robots were installed all over the world. If you compare the industries you must assume that the food sector still offers considerable potential for using new robot applications. Here are by far the automotive industry and the chemical industry in the stands one and two.

**Robots in food production**

It is no wonder that robots were originally used in the food and drink industry for heavy work, for example in packaging and loading

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<td>Manual mechanical conversion</td>
</tr>
<tr>
<td>Reuseability</td>
<td>A specialist machine for a task</td>
</tr>
</tbody>
</table>

Fig 1: Criteria for making a decision about whether automating a process is sensible.

Fig 2: Automation technology versus robotics – Advantages and disadvantages of the two different technologies.
pallets, because they were originally designed precisely for such tasks. The road to actual production and thus to direct contact with food was, however, barred to robots for a long time. First of all massive hurdles had to be overcome in order to meet the particular requirements for the manufacture of food. These were high, uncompromising, hygienic requirements, the sometimes corrosive conditions that could result from the foodstuffs themselves or the mechanical environment, such as extreme humidity, high or low temperatures, salt and acid content, shapes, sizes and colours of natural raw materials that could not be standardised and their rheological properties and mechanical sensitivity. But it was precisely these conditions that made the use of robots in the food and drink industry appear sensible or desirable. The argument for humanising the working environment also played an important part as did further improvements in food safety or the permanent problem of having to make manufacturing food as effective and reasonably priced as possible. Who wants to perform predominantly monotonous work eight hours a day at a room temperature of eight degrees Celsius? And how can you eliminate as permanently as possible contact with human skin which is one of the major potential sources of microbial contamination? Or how can people perform running processes in accordance with standardised guidelines not only for eight but, if possible, for 24 hours a day? In view of the mostly extensive product ranges in individual, mainly small and medium-sized food production companies and the associated need for flexibility at various levels this practically cries out for technical solutions that robots are basically able to provide. Thus developers and manufacturers of robots were required, even though they could not solve the upcoming problems alone and had to use other areas of science and technology.

Food-compatible robots

One incontrovertible requirement for using robots in the food industry was the possibility of being able to clean them properly with normal agents and methods and if necessary also disinfect them. In order to be able to meet this requirement, hygienic design is taken into consideration in various ways with food-compatible robots. Whereas so-called wash down robots are covered with an easily washable, replaceable hygienic protective cover, (protection class EP 65), other manufacturers are trying appropriate protective coatings such as epoxide paints or they build their robots completely from stainless steel, which is resistant to cleaning agents, acids and alkalis. It also goes without saying...
that with robots too, food-compatible lubricating greases (NSF H1 certified) are used.

**Robots are becoming more intelligent**

Advances in IT must be seen as a quantum leap in the development and use of robots, in food production as well amongst other things: Thus dramatically improved computer power-to-gether with corresponding software solutions have not only led to the fact that robots themselves have become more intelligent and efficient. By combining highly-developed optical systems for image recording and evaluation they are now in a position to „see” and also respond to situations based on clearly defined parameters. In practice, image processing means that an object to be analysed, e.g. a biscuit or packaging, is photographed with a suitable camera under suitable light conditions and the pictures sent to a computer. After being processed electronically they are analysed and the results are then used to generate control commands, for example to trigger a reject mechanism. A pre-requisite for solving the complex evaluations that are possible today was the introduction of logical image evaluation by so-called perceptrons, i.e. multi-layered neuron networks as demonstrated in nature in our nervous system.

And robots are becoming gentler

The gripper technology is one of the most important aspects of the solution of automation processes using robots in two respects: First of all the solutions must be matched with the physical and mechanical properties of the relevant foodstuff because the grippers must do their job, of course, but must not leave any visible traces on the products. And secondly, grip-per systems must be able to cope uncompromisingly with the high hygienic demands in the food industry. Depending on the operating principle, grippers are mainly divided into me-chanical, pneumatic, pneumostatic and pneumodynamic, electrical and adhesive grippers where almost all operating principles can be found in connection with handling foodstuffs. If considerable progress has been made with grippers in the last few years, there is still a con-siderable amount of work to do in this field in order to be able to meet the various requirements of the different sectors of the food industry. The fact that all these developments in robotics must be combined and implemented in new robot models is just one side of the coin. In industrial practice robots must then be synchronised with each other and with other compo-nents of a manufacturing process or a manufacturing line with which the IT and system spe-cialists are required to demonstrate their abilities.

Using a robot for the first time

Using robots for the first time in an operation in direct contact with food means not only making the right technical deci-sions but rather the whole operation must be included on the way to introducing them. Every single employee must be in favour of the project and completely different arguments come in useful. However, ultimately everybody in the company must be convinced that they are pioneers in the industry and that they are taking part in the pinnacle of technical development. „The whole operation“ means actually „the whole company“ starting with the technical manager and progressing through management, the production committee, quality management, factory managers, service technicians up to the works council and the whole work force. Thus prepared, the technical topic is finally no longer an actual problem.
Wilhelm Book, Regional Manager at Schäfer’s in Teutschenthal, first came into close contact with robots in food production in 2010 at the symposium of the same name, organised by the German Agricultural Society (DLG, Deutsche Landwirtschafts-Gesellschaft) at the German Institute of Food Technologies (Deutsches Institut für Lebensmitteltechnik e.V. - DIL) in Quakenbrück. The master baker was won over by the arguments for making practical use of a robot within the company. Subsequently, he explored the possibility of installing a robot solution at the company. Now, for the past eight months, the company has been using a system for stacking dough trays onto trolleys, which has surpassed all expectations. Every day around 10,000 trays are processed by the system and piled up in stacks consisting of 36 full trays plus one empty tray. Next morning, the drivers then deliver these to the more than 200 affiliated branches that are covered by Teutschenthal. The branch near Halle an der Saale is one of five bakeries affiliated with Edeka Minden-Hannover.

Planning

Further to several site inspections and some intensive brainstorming, it became apparent that stacking...
dough trays would be the way to make the most appropriate use of a robot. Rolf Peters from K-Robotix in Bremen was involved in the project during this planning stage, and it was he who established contact with mechanical engineering company Heinz Mayer. The company from Holzmaden, which has its origins in the automotive industry, was responsible for the conveyor technology, the robot application and the gripper. The initial step in the planning stage was to meticulously record all the relevant data. The number of trays to be processed per hour was defined by the two WP Kemper bread roll lines. These operate in six rows with an output of around 8,500 dough pieces per hour, which are deposited onto two adjacent plastic trays via a removable belt. Each tray takes 15 dough pieces and is subsequently conducted to a return station. Here, the rows are formed for the Koma turbo runner, which is a tunnel for conditioning dough pieces. In order to achieve maximum utilisation of six units per row, ideally three trays should be accommodated by each bread roll line. The transport system at the outlet of the turbo runner and the subsequent stacking system with robotics also needed to be designed accordingly. First of all, the trays are picked up by non-driven roller conveyors. The baking trays approach the first end stop via the construction-induced gradient. Stoppers made of spring sheet metal reduce the speed of the trays prior to contact, thus preventing the cooled dough pieces from being displaced erratically on the tray. Before the end stop and stopper are lowered and open up the path to the subsequent toothed belt conveyor, this must be completely empty. This belt conducts the trays taken off to the stacker, but also in the opposite direction to the integrated bypass, which enables the system to be emptied manually in the event of a malfunction. The stacker itself always piles up twelve baking trays to form one unit. The stacks are packed bottom-up. After each tray, a pneumatic linear actu-
ator raises the stack by one stroke and, on reaching the specified total quantity, pushes the entire unit to a transfer station. From there, the tower is then immediately moved via another conveyor belt to the removal station, which fulfills two functions. Firstly, in a fully automated procedure, an empty tray, which is stored in the storage area above the removal station, is placed on the last stack of each tower. Once a critical limit is reached, a built-in sensor gives the command to the robot, which fills up the hopper again with empty trays from another storage area. The buffer station is designed as a double storage area, so that the process is not interrupted by the machine operator reloading. Secondly, the parallel gripper, which has been specifically designed for this application, grabs hold of the stack in order to lift it onto the trolley in the available positioning station. With a load-bearing capacity of 70 kg, the robot was selected on the basis of its ability to easily lift a tray stack of around 32 kg. Three cells are installed for two-way loading. An employee is responsible for removing the completed tray stack and for positioning empty trolleys in the station.

**Workplace**

In order to justify investment in new technology, convincing arguments are needed to win over the decision-makers. In the solution presented, two employees whose job was to manually remove the trays at the outlet of the turbo runner could be used elsewhere within the company. The first criterion in the decision-making process is a comparison of the

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Managing Director: Ralf Hawig, Marius Lissal
Regional management: Wilhelm Book
Bakery plants: 5
Total employees: 6,500
Plant Teutschenthal:
Branches: approx. 200
Sales employees: approx. 800
Production employees: approx. 350
Certifications: HACCP

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In the event of a malfunction in the stacking station area, the trays can be removed from the system via an integrated bypass.
investment amount for the project and the current ongoing labour costs. For Book, however, this was not the most important criterion: „Working for eight to nine hours a day with cold trays put a great strain on my colleagues. That’s why, for me, making working conditions less stressful for the employees was paramount.“ This preliminary assessment by the Regional Manager was fully validated post-installation. The new staff member has become an integral part of the production process, accepted by its co-workers. Also very helpful in this regard was the high degree of professional expertise of the staff in Teutschenthal, who are much happier carrying out tasks typical of bakers rather than undertaking monotonous work. Moreover, some employees were able to expand their job profile. The tray filling monitoring was relocated to the bread roll line area. Here, the baker is now responsible for manoeuvring the baking trays, filled with 15 correctly-placed dough pieces, into the turbo runner. Also, employees who carry out the operation and monitoring of the system on the touch-panel have undergone training. Staff responsible are protected from accidents by light protection screens at the access areas and by the fact that the entire area is enclosed. If anyone should enter the positioning station, this area ceases to be controlled by the robot and can only be enabled again via a switch. Tray stacking in the two other areas remains possible, however. Should the employee proceed further, a second contact is triggered and the robot stops activity immediately. In addition to the features described, Book was also reassured by the good planning, the trial run carried out at mechanical engineering company Mayer and the subsequent commissioning, which did not affect the course of operation in any way. Motivated by this project, the manager is filled with enthusiasm and looking forward to a bright future. „We are very pleased with the first installation of a robot solution at our bakery. Looking to the future, what I would really like is a robot that I can use at various points in the company with maximum flexibility.“

Gregor Vogelpohl
Enzymes in baked goods manufacture

It’s hard to imagine life without enzymes in today’s manufacture of baked goods: Improved dough properties, bread volume, crust colour and keeping fresh for longer are just some examples of the effects of these small helpers.

Enzymes are proteins that occur naturally in every living organism, in single cell organisms as well as plant, animal and human cells. What they do: The perform all necessary metabolism processes very effectively and specifically. However, enzymes are not only active in cells but can also be effective outside. It is precisely this that people have been making use of in food manufacture for thousands of years, when making wine, cheese or even baking bread. Unlike in days gone by today we no longer rely solely on enzymes that are contained naturally in raw materials and that occur when preparing dough because they can be very different in terms of their quantity and also their activities. This would obviously lead to differences in quality. Therefore, nowadays specific enzymes are used in food manufacture. They are predominantly biotechnological, which means they are produced with the help of micro-organisms. Biotechnology has come on in leaps and bounds and is, undoubtedly, one of the most innovative areas of food raw materials. This article
explains how enzymes are normally used today in the manufacture of baked goods. It will also tell you the different ways enzymes can be used for manufacturing baked goods from a technological point of view. These options have not yet been fully exhausted.

What are enzymes?

Enzymes consist either purely of protein or a protein component, the apoenzyme, and a co-factor. The apoenzyme and the co-factor together form the active enzyme. Enzymes catalyse biochemical reactions, which means that when using enzymes reactions can take place at higher speeds and under milder conditions and that in this process the enzyme is not used up but is available for further reactions (Fig. 1). As enzymes are such outstanding catalysts, we are inclined to endow them with effects they don’t have: Thus an enzyme does not shift the balance of a reaction but mainly catalyses the forward and reverse reactions equally¹. The amounts of enzymes required are correspondingly low and are given in ppm (parts per million) or milligrams per kilogram. Compared with chemical agents enzymes have a significantly higher reaction and substrate specificity which means that they only catalyse a specific reaction step in a very specific substance called the substrate. However, enzymes are relatively demanding with regard to their environment. They only work under very specific conditions. The critical influencing factors here are mainly temperature and pH value. Also important are the water activity and the concentration of substrates and products, salts and substances that can prevent enzyme activity, enzyme inhibitors.

Where do enzymes come from?

Enzymes that are normally used for baked goods manufacture usually occur naturally in plant raw materials, such as grain or soya. Thus when grain germinates, amylases are formed that break down starch. This process is exploited in the manufacture of malt for bakeries and breweries. Thus, for example, the inside of bread for toasting can stay a light colour by adding soya flour. The background: Soya flour contains a lipoxygenase that oxidises carotinoids. This lipoxygenase can alternatively be extracted from soya flour and used as an isolated enzyme. Most enzymes used for manufacturing baked goods are manufactured biotechnologically with the help of micro-organisms. The nutrients used for the micro-organisms in these fermentation processes are agricultural products, such as sugar, starch and proteins. The micro-organisms metabolise these nutrients producing enzymes in the process and excrete them into the nutrient fluid. Therefore the cells of the micro-organisms do not need to be broken up in order to obtain the enzyme. The enzymes are extracted from the nutrient fluid by centrifugation, filtration and further cleaning steps and after being dried are standardised into an enzyme preparation with reliable activity.

Classifying and naming enzymes

For historical reasons enzymes are normally classified by their substrate type in the baking industry. Typical substrates in baked goods manufacture are starch or amylose, proteins and fats or lipids. The name of the enzyme or enzyme class is taken from the substrate name by replacing the final syllable with the ending „ase“. Amylose-dissociative enzymes are called amylases, protein-dissociative ones proteases and lipid-dissociative ones lipases.

Enzymes exploit the potential of ingredients

Enzymes always need a substrate that they convert into a product. The perceptible difference in the properties of the dough or the baked goods is then based on the different characteristics between the substrate and the product produced from it or even its avai-
lability and occurrence as the process progresses. Because they are used in such small doses, enzymes themselves have no direct effect on the dough properties or the finished baked goods. Enzymes are denatured and thus rendered inactive by the baking process. Afterwards they are no more than a small amount of protein. Different effects can be achieved in the dough or the cakes or during the manufacturing process depending on the type of enzyme added or contained naturally in the raw materials.

Amylases

Alpha amylase splits the amylase and amylopectin starch fractions into sugar and dextrines (Fig. 2). These are nutrients for the yeast and contribute to browning the crust. Beta amylase separates maltose from the end of the starch chains. It occurs naturally in flour but is of secondary importance in baking technology. Maltogenic amylase splits maltose units and G4 amylases separate dextrines with an average of four glucose units from the end of the starch chains. The functionality in both of them is based less on the formation of sugars but rather in the change to the remaining starch matrix. It thus reduces recrystallisation of the starch modified by enzyme activity. This is called retrogradation and stops the products going stale quickly. This enzyme is, thus, a traditional enzyme that keeps goods fresh. Glucoamylase separates glucose units. Depending on when the glucose is formed in the process it is used as a nutrient for the yeast or may contribute to the crust browning.

Glucose oxidase

Glucose oxidase oxidises glucose by creating gluconic acid from hydrogen peroxide. However, for this it requires oxygen as a reaction partner. The hydrogen peroxide formed is a partner in the oxidation reactions that help to form cross-linking disulphide bridges in the gluten network. Glucose oxidase thus reinforces the gluten, reduces viscosity and increases tolerance to cooking. Sometimes ascorbic acid, that is used as a flour treatment agent, is replaced by glucose oxidase.

Hemicellulases

Pentosanases, xylanases. The substrate for hemicellulases is hemicelluloses which are contained in flour as part of the cell walls of grain. Hemicelluloses are chain-shaped molecules that contain pentoses, i.e. sugar with five carbon atoms, as building blocks. For this reason the name pentosanes has been traditionally used for hemicelluloses. It could be demonstrated that water absorption is due almost exclusively to the hemicellulose fraction of arabinoxylans. For this reason the specific term, xylanase, is normally used today. Long-chain arabinoxylans are split
into medium-chain fragments hydrolytically by xylanases as a result of which the water binding capacity increases. With the same water content xylanases lead to dryer, less sticky doughs and make a large contribution to a higher volume of baked goods (Fig. 4). However, if hydrolysis of the arabinoxylans continues and if short-chain fragments are obtained, then the effect is reversed, the dough becomes stickier and the dough stability decreases.

Cellulases

Cellulases hydrolyse cellulose that occurs in corn and flour closely associated with hemicelluloses. A synergetic effect may occur as a result of the cellulose being hydrolysed by increasing the availability of the hemicelluloses.

Proteinases

Proteinases hydrolyse proteins into short-chain peptides and amino acids. At the right dose they control high gluten flours and thus prevent tightening, i.e. the doughs contracting. A possible application for this is laminated doughs that experience high mechanical loads.

Lipases

The substrates of lipases are lipids. Lipases may have a preference for polar lipids, such as glycolipids of flour and phospholipids, such as lecithin or neutral lipids such as triglycerides. All these groups of elements produce a product that has greater emulsifying properties than the original substrate by separating a fatty acid. Lecithin is thus converted into what is called lyso-lecithin and mono and diglycerides are produced from triglycerides. They can thus replace the addition of emulsifiers partially or completely. In bread and rolls they contribute significantly to dough stability. In cakes lipases give a softer inside and keep them fresh longer.

What do enzymes need to work?

The activity of an enzyme depends on the availability of the substrate. Amylases cannot convert starch from undamaged starch granules. However, in the dough phase only a small proportion of damaged starch is available as a substrate. Starch is available when starch is gelatinised at high temperatures. However, now the temperature stability and temperature optima of the enzymes must be taken into consideration. Temperature-stable enzymes come, for example, from thermophilic, i.e. heat-loving bacteria. These enzymes show their highest level of activity at temperatures of around 80 °C before they are finally denatured and thus rendered inactive at about 95 °C. In order to prevent these enzymes working too quickly in the presence of pre-gelatinised starch, they can also be enclosed in lipids. They are activated then at the temperature that the lipid shell melts. Variants with different temperature optima are also known with xylanases. These can be combined to control the dough properties firstly to cover the whole process from the kneading phase up to baking and secondly not to exceed the optimum too early.

And what can slow them down?

Low pH values do not necessarily denature an enzyme but often reduce its activity considerably. Therefore enzymes that have sufficient activity with low, acid pH values are required for rye mixture and rye breads which are leavened. However, the type of reactions and effects do not differ from those previously described. Acid-tolerant enzymes are becoming increasingly available. A typical effect of enzyme conversions is product inhibition. For example, high sugar concentrations inhibit the further saccharification of starch so that the traditional amylase is less active in cakes. Today there are new, sugar-tolerant amylases available for this. Enzymes and enzyme preparations can have secondary activities in spite of a high level of specificity. Here are some of the secondary activities of the actual enzyme. Some hemicelluloses can, for example, also split cellulose and vice versa because of the similarities in the structure of cellulose and hemicelluloses. On the other hand there are also secondary activities that are due to other accompanying enzymes. Micro-organisms not only produce the main enzyme that they should produce but also other secondary products that often cannot be completely separated. Thus in the past it was normal for amylase preparations always...
to have a certain protease activity. However, the trend for many years now has been towards purer preparations with specifically known and described main activities and, in an ideal situation, no secondary activities.

Enzymes can replace emulsifiers

There are basically two different approaches when replacing emulsifiers with enzymes. Based on the ingredients available the enzymes either create a similar structure to that of the emulsifier. This applies when using lipases which, for example, convert triglyceride into mono and diglycerides. Monoglycerides form complexes with the starch and inhibit retrogradation. If you take the other approach, the enzymes create a similar effect of a completely different type. Maltogenic amylases can, for example, as described on Page 77, influence the starch in a way that slows down retrogradation, an effect that was otherwise achieved with emulsifiers. Producing emulsifiers using chemical process engineering requires high temperatures and pressures. On the other hand, enzymes are produced biotechnologically, under mild conditions, i.e. at fermentation temperatures of about 40°C. Because of the fact that the dosage of enzymes that show an emulsifying effect is 100 times lower than that of emulsifiers, there is a significant ecological advantage both in terms of production and also in terms of transport.

Enzymes can help bread to stay fresh

If bread keeps fresh longer, this doesn’t help to sell more bread. Quite the opposite: In the current discussions about wasting food, it is becoming clearer and clearer that apart from fresh fruit and vegetables, it is primarily bread that is thrown away, probably about 20% of the amount produced. Less bread could be wasted if enzymes help it to keep for longer. At the same time there would be a corresponding saving on transport and the necessary packaging.

Enzymes and allergies

When we talk about allergies associated with grain, flour and bread, normally a difference is made between the consumption of bread and baked goods and the risks to workers when they are manufactured. No allergic reactions to the enzymes used have been notified up till now from the consumption of baked goods made with enzymes. The reactions to 19 frequently used food enzymes were investigated in a study with 400 allergy sufferers who were allergic to typical allergens, such as birch and grass pollens, domestic pets and food such as eggs, milk and nuts. None of the patients showed a specific allergic reaction or cross reaction to these enzymes. Normally the enzymes are denatured by the heat in the baking process as a result of which the allergenic potential can change. Allergic reactions were, however, also not reported after taking active enzymes in high doses, as they are sometimes consumed as aids to digestion. In addition, no cross reactions have been notified up till now to bread made with enzymes with other known allergens.

Risks at the workplace

Dust in flours, mixed operations and bakeries constitute a health risk for staff. Dust may lead to irritation of the skin, eyes and airways and to sensitisation up to allergies and asthma if exposure is too great, i.e. frequent contact and high concentrations. In one study allergens to which bakers with work-related respiratory symptoms or asthma reacted were identified. In this mainly proteins in flour were identified as allergens. Typical baking enzymes were also the subject of investigations but were not the main allergens in this study.

Author

Dr. Franz Mayer is state-certified qualified food chemist and qualified baker. He is responsible for the enzyme division at CSM in Bingen in the „Bakery Ingredients Innovation Centre“.

ASPARAGINASE

An enzymatic aid against acrylamide. After several reaction steps acrylamide is created from the amino acid asparagine and glucose. The substance, classified as potentially carcinogenic, hit the headlines in 2002 because it could be found in specific starch containing foods that were at the same time highly heated. The enzyme asparaginase converts the amino acid asparagine into the amino acid asparagine acid, removes the preliminary stage from the reaction and thus prevents the formation of acrylamide. This application is used more in biscuits, crisps and chips and does not play a large role in bread and roles because these products are not critical with regard to their acrylamide concentration.
Enzymes cannot be replaced in the manufacture of baked goods and offer even greater innovation potential. They demonstrate unique technological effects that cannot often be achieved by additives. They are produced biotechnologically and are based on renewable raw materials. As a result of the low doses required, the ecobalance of enzymes is superior to that of additives. Regardless of all future labelling rules, enzymes continue to be used and will probably continue to be used increasingly in the future.

Franz Mayer, CSM Germany

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