Food Flash

2022

EDITORIAL

Shoulder to shoulder with the food industry

Today Stäubli robots automate highly sensitive processes in the food sector that not so long ago were considered beyond the scope of automation: They slice cheese, debone meat, fillet fish, portion poultry, decorate confectionery, and peel fruit.

The ability of our four- and six-axis robots to operate in direct contact with unwrapped foods in full compliance with applicable hygiene standards is the result of systematic research and development. For many years now, Stäubli has been working in collaboration with the food industry to bring pioneering robotic solutions to market. A major milestone was passed with the introduction of the HE and H1 special editions, which have enabled us to enter completely new markets in the food sector.

As the “HE” designation suggests, these robots are designed for use in humid environments and in applications in which they are exposed to water spray. They can safely withstand the intensive cleaning and sterilization processes that are prevalent in the food sector – processes that no other robot would survive. Today, the complete Stäubli robot range is available in the HE specification. All four- and six-axis robots can also be ordered with NSF H1 class food-grade oil.

Meanwhile, with the launch of cleanroom-compatible AGVs, Stäubli WFT proves that development does not stand still. These driverless transport systems can revolutionize intralogistics in food production, making processes more autonomous, flexible and productive than ever.

It goes without saying that all Stäubli solutions are Industry 4.0 compatible and feature the common interfaces for digital connection to higher-level control systems. The examples described in this brochure illustrate just how powerful our robots are in practice. For your next project, you too can rely on the many years of expertise of the robot manufacturer with what is likely the greatest experience in the food sector.

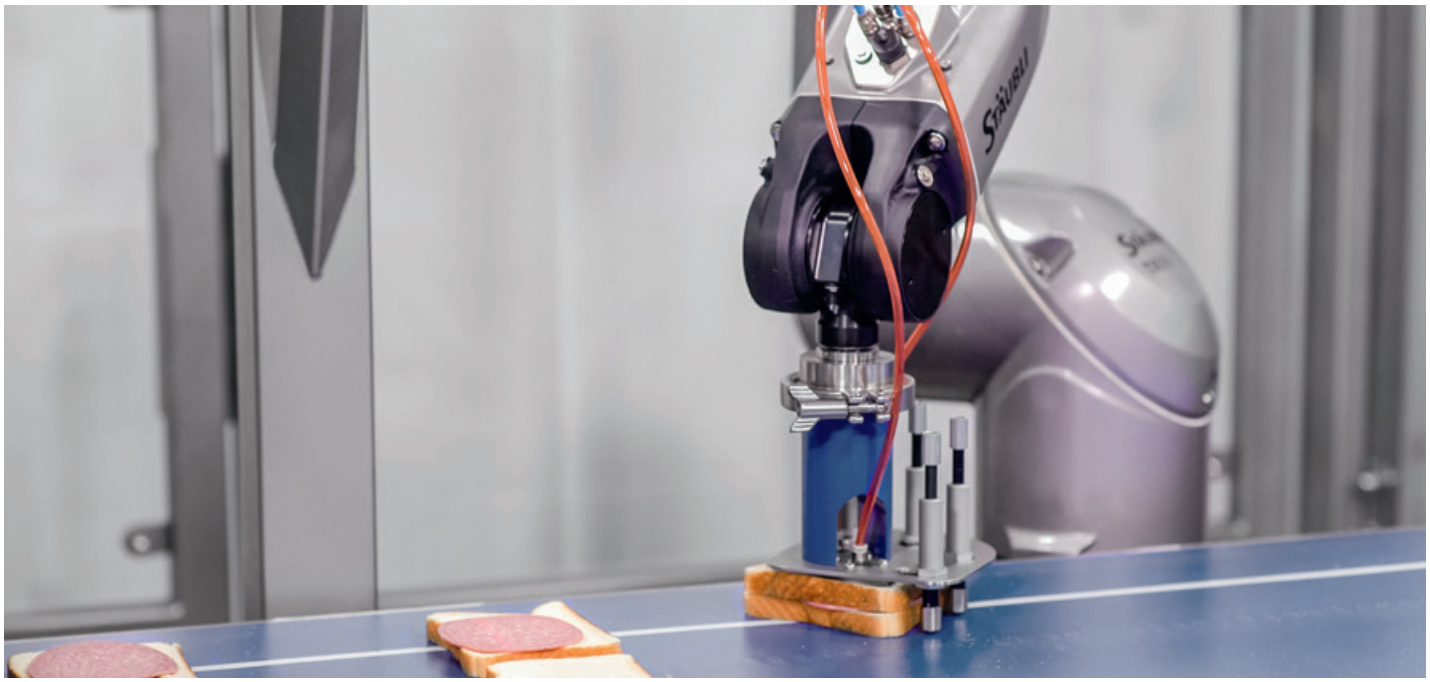
We hope you enjoy reading this brochure.

Sincerely,
Christophe Coulongeat
Executive President Stäubli Robotics

More info

STÄUBLI ROBOTS IN THE FOOD SECTOR

Fit for Food



Due to their outstanding resistance to antibacterial cleaning procedures, Stäubli robots are now regarded as the benchmark in many sensitive applications.

A comprehensive robotics portfolio for the food industry

Automation in the food industry is progressing rapidly. High-performance robots that reliably comply with industry-specific hygiene requirements are in high demand. For food applications of all kinds, Stäubli has a well-balanced portfolio of high-performance four- and six-axis robots that safely handle even the most sensitive applications involving unwrapped food.

Stäubli focused on working with food producers decades ago, and today has not only proven expertise in this sector, but also perhaps the broadest and most powerful range of robots. Transporting, handling, sorting, processing, labeling, packaging, palletizing – Stäubli robots master every process step safely, cleanly and quickly.

All four- and six-axis robots can now be individually adapted to the specific requirements of every application. Due to their hygienic design and thus exemplary cleanroom compatibility, all Stäubli robot models fulfill the most exacting requirements for use in the food industry. If the cleanroom classification of a standard model is insufficient, optional cleanroom versions up to ISO 2 are available.

Food industry benchmark: HE special versions with H1 oil

Whenever and wherever robots come into direct contact with unwrapped food, Stäubli robots set the standard with the combination of HE and H1 options. H1 denotes models that operate with NSF H1 class food-grade oil. The use of special lubricants guarantees that the robot can be operated without any restrictions on performance.

HE models – HE stands for humid environment – are specially modified for use in areas where they are exposed to water vapor or spray. HE robots are built to withstand the cleaning processes that are typical of hygienically sensitive production lines. While such harsh treatment would destroy conventional robots, the HE versions continue working with their usual reliability.

Best of all, the HE and H1 options are available for the entire robot range.

New SCARAs to replace the FAST picker

Just how powerful the latest generations of Stäubli robots have become is exemplified by the completely newly developed SCARAs in the TS2 series. These four-axis robots achieve a level of performance that comes close to that of delta kinematics. Since they are easier to integrate and do not have to be positioned directly above sensitive food products, they offer the perfect substitute for delta kinematics in handling, sorting and packaging processes.

Stäubli's JCS drive technology, which is already setting standards in our six-axis machines, is the key to the impressive performance of the TS2 four-axis models. This hollow shaft technology facilitates a unique enclosed hygienic design with internal media and supply lines. The star of the series is its largest representative, the TS2-100. This four-axis machine can operate over working areas with a diameter of two meters – a feature that makes it particularly attractive for many food applications.

Sustainable, process-safe and Industry 4.0 compatible

In addition to outstanding dynamics and precision, the superior drive technology of all Stäubli four- and six-axis robots also ensures a considerably above-average service life while minimizing maintenance requirements. By relieving employees of monotonous and strenuous tasks, Stäubli robots make a decisive contribution to the humanization of the workplace. At the same time, the connectivity of these machines makes them easy to integrate, even in smart production environments.

The robots are Industry 4.0 compatible and can be readily integrated into smart production environments. Thanks to their superior drive technology, reliability and durability, they also impress in terms of sustainability and energy efficiency.

Main applications of Stäubli robots in the food sector

Dairy industry:
- A wide variety of manufacturing processes
- Machining processes such as ultrasonic cutting, milling, coating, polishing
- Handling tasks in the manufacturing and ripening process
- Primary and secondary packaging

Meat and sausage industry:
- Cutting, deboning, trimming and portioning (ultrasonic, water jet)
- Loading and unloading of processing machines (portioning, deboning)
- Primary and secondary packaging

Poultry industry:
- Loading and unloading of processes of processing machines (portioning, deboning)
- Portioning (water jet cutting)
- Primary and secondary packaging

Fish industry:
- Sorting tasks (shrimp, prawns, sushi)
- Loading and unloading processes of processing machines (filleting)
- Primary and secondary packaging

Baking and confectionery:
- Dispensing and decorating
- Cutting processes (bread, rolls)
- Portioning (ultrasound)
- Loading and unloading
- Primary and secondary packaging

Fruit and vegetables:
- Peeling, cutting and portioning
- Loading and unloading
- Primary and secondary packaging

HYGIENIC DESIGN

Focus on process safety and hygiene

In their comments on the latest generation of four- and six-axis robots from Stäubli, experts single out the compact, enclosed and streamlined design of the machines. This is no coincidence: The robots are structured for maximum hygiene and meet EHEDG (European Hygienic Engineering and Design Group) guidelines.

For the past three decades the EHEDG, an association of food production equipment manufacturers, food processing companies, research institutes and public health authorities, has been working intensively to optimize hygiene standards in the food sector. The EHEDG focuses not only on hygiene measures in the production and packaging of food; it also draws up corresponding guidelines.

These guidelines, along with suggestions from food manufacturers in all subsectors, have been flowing into the R&D department at Stäubli Robotics for many years. There, technicians and engineers have explored solutions to reduce the particle emissions of next-generation robots to a minimum. At the same time, robots have had to be

The requirements of cheese dairies are particularly high, given the use of bacteria and other types of microbes. The equipment is cleaned with fat-dissolving, alkaline and milkstone-dissolving acidic agents, and with water heated to 55°C. Image: Plangger organic cheese dairy in the Austrian Tyrol

designed to withstand the daily cleaning procedures required by certain food applications without sustaining damage, thus ensuring maximum availability in highly automated processes.

The four-axis robots of the TS2 series as well as the TX2 six-axis models exemplify the type of solutions that have been implemented. What is striking about the modular robots is their compact, enclosed design with internal media and supply lines: There is no external cable packet, and thus no interference contours, sources of error, or unnecessary particle emissions. A fully sealed housing, consistent use of non-protruding screws, optional concealed connections under the base of the robot, and the systematic avoidance of dead spaces – this is how hygienic design in protection class IP65/67 looks today.

HE and H1 versions with no loss of performance

But cleanroom-compatible design alone is not enough to satisfy the complex set of requirements for applications involving unwrapped foods. Any robots used in this type of environment must of course operate with NSF H1 class food-grade oil. Stäubli now offers the H1 option for every robot. The remarkable aspect of this is that the development of special lubricants has enabled these versions to operate continuously without any restrictions on their performance, while most robots from market competitors have to significantly scale back their performance in the presence of H1 oil.

"With the launch of the HE robots in 2010, Stäubli achieved a breakthrough in the robot-based automation of sensitive food processes that were previously considered unautomatable."

Didier Piffet
Global Food Market Leader Robotics

One of the greatest challenges, however, was to enable the robots to withstand the cleaning procedures that take place several times a day in the food industry. Thanks to refinements in their design, the robots are able to undergo the same HACCP cleaning procedures as other system components.

Stäubli Robotics has provided a pioneering solution in the form of the HE robot series. HE stands for "Humid Environment" and identifies all Stäubli robots that have been specially modified to endure exposure to liquid vapor and spray. Materials such as plastic or carbon are unsuitable and therefore not used. The housing has a specially treated, corrosion-resistant surface. Parts that are particularly stressed are made of stainless steel. The coating has a high-quality finish to inhibit particle adhesion.

Resistant to cleaning agents in the 2 to 12 pH range

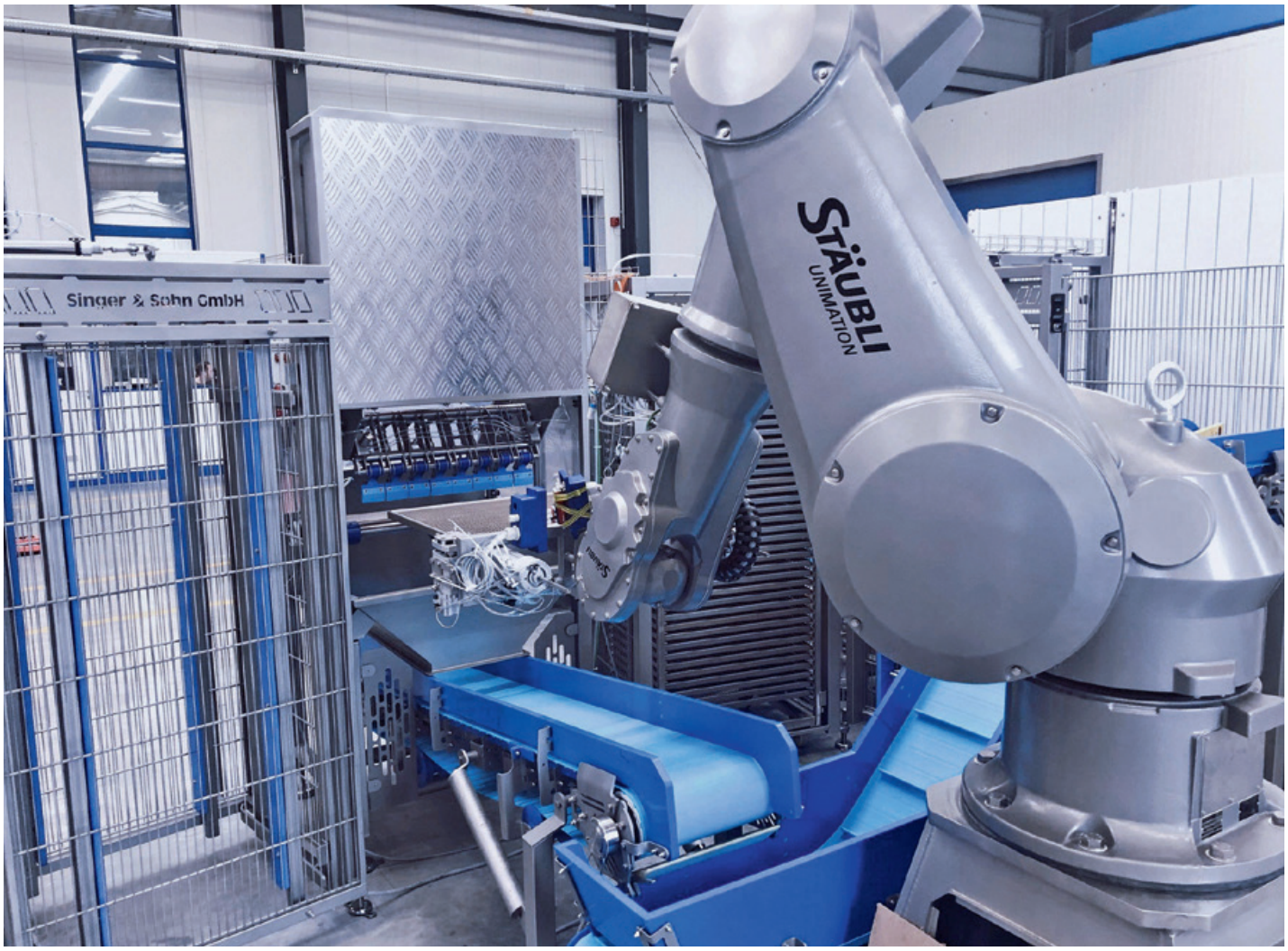
The robots are completely encapsulated and conform to IP65 protection standards. To further increase the degree of protection and prevent the formation of bacteria and corrosion as much as possible, the entire arm can be pressurized by means of an overpressure unit. The wrist of the machine is rated IP67 and therefore waterproof. The vertical cable feed is especially helpful: All connections are located under the base of the robot, safe from water splashes and spray.

With these and many other detailed measures, the HE models have established themselves as the robot of choice for use on unwrapped food. All four- and six-axis robots are now available as HE versions. These robots can even survive cleaning with aqueous media in the pH range from 2 to 12 over an extremely long service life without sustaining any damage. This means that the complete Stäubli robot range not only complies with EHEDG guidelines, but also fulfills the expectations of discerning users from the food industry all over the world.

Whether they are deployed in deboning joints of meat, slicing cheese, portioning fish and poultry, or in primary packaging of food, Stäubli robots are synonymous with process reliability.

PET FOOD

20 tons of pet food per day



The robot guides the trays with the treats into the stripping station. Left: One of two docking stations for the trolleys with the trays.

In the pet food industry, an innovative production line has automated some unusual tasks, such as stripping treats from still warm baking trays. At the heart of the process is a powerful Stäubli six-axis robot designed for humid environments.

The task was clearly degined: Freshly produced pet food was to be removed from the drying trays after drying and fed into the packaging station. The challenge here was that, while most treats for dogs and cats are readily loosened from the metal sheeting, others remain stuck and have to be removed with a mechanical scraper.

The pet food manufacturer entrusted this project to Singer & Sohn GmbH in Berching, Germany. Over the past 40 years, Singer & Sohn has built a reputation as a specialty provider of automated systems for the food production sector. “We focus our entire ef-

> "The robot operates with high positioning accuracy, the kinematics are extremely rigid, and its HE design makes it totally resistant to the intensive cleaning processes that are scheduled on a regular basis."

Christian Singer
Managing Director of Singer & Sohn GmbH

forts on food technology," says Managing Director Christian Singer.

Stringent requirements for hygiene

Hygiene was a major consideration in the specifications for this project. Because the production lines are regularly hosed off with water, only a splash-proof robot would fit the bill. This narrowed the choice to a Stäubli HE model. Other selection criteria for the robot included high speed and positioning accuracy, as well as resistance to externally applied force. The following description of the system clarifies the importance of these factors.

Scrapers detach the treats from the tray while the robot holds it steady

After the drying process, the trays with the finished treats are slotted into a trolley and transported to the robot cell. The operator pushes the trolley, each of which contains 39 trays, into one of two docking stations located to the left and right of the scraping station, locking it firmly in place.

The six-axis robot mounted directly in front of this station grips the first tray, carefully eases it slightly out of the trolley, then grasps it fully and ferries it to the scraping station. There, a scraper device detaches

The detached treats are removed via conveyor belt, collected in boxes, and fed into the final packaging.

each treat from the tray using the required force, while still handling the product gently. From the robot's perspective, they work their way forward from back to front.

All the while, the Stäubli TX200 holds the tray rock steady without any external support. This is where the six-axis robot scores high marks for the extraordinary rigidity of its axes. The TX200 has the strength to apply the requisite counterforce to the vigorous scraping motion. Of equal importance is its tolerance of temperature fluctuations: The trays come straight from the drying oven and continue to radiate heat accordingly.

After the scraping process, the robot returns the tray to the trolley and pulls out the next one. Approximately 2.5 kilos of treats are gathered in a single pass. They fall onto a conveyor belt, where loose crumbs are removed by sieving. In the next process step, the system guides the contents of four trays into a box, which is then delivered to the final packaging station.

Well chosen: The performance is just right

Christian Singer sums up the reasons why the plant engineers chose a Stäubli TX200 HE: "The robot operates with high positioning accuracy, the kinematics are extremely rigid, and the HE specification makes it totally resistant to the frequent intensive cleaning processes."

The robot further impresses by virtue of its above-average dynamics in this payload class. The outstanding performance of the TX200 even made it possible to surpass the cycle times specified by the customer: Instead of the requisite five trays per minute, the system manages six.

The robot cell with a Stäubli TX200 HE in charge of handling the trays has been in constant three-shift operation since June 2020, handling a daily throughput of around 8 000 trays loaded with more than 20 tons of pet food – thus also proving the system's reproducibility and robustness.

A glimpse inside a robot cell

In a cycle time of around two minutes, the rind is shaved off at a constant depth with precise path tracking. Previously, the strenuous manual scraping process took around 10 minutes per block.

The robot is internally pressurized up to 50 mbar so that no cleaning agent can penetrate from the outside. It withstands hot water jets, foaming with chemical detergents, and manual brushing.

The TX2-90 HE endures intensive cleaning with water jet lance and aggressive media.

CHEESE DAIRY

The ultimate endurance test for a robot

At an organic cheese dairy in the Austrian Tyrol, a Stäubli six-axis robot is busy de-rinding and coating irregularly shaped blocks of cheese, a demanding job that calls for maximum resilience. The TX2-90 HE is able to withstand intensive cleaning with aggressive media delivered by a water jet lance, which would soon spell the end for the average standard robot.

At any one time, up to 650 tons of organic cheese made with milk from the finest Tyrolean hay-fed cows are maturing inside the 160-meter-long, 10-meter-high manmade cave of the Plangger cheese dairy in the idyllic village of Niederndorf. The tunnel was only blasted out of the rock face in 2015, and is now crucial to the high standards of the organic cheese dairy, which prides itself on the production of quality food in harmony with nature.

Reinhard Brunner, Master Cheesemaker and Junior Manager of the Plangger cheese dairy explains: “In order to increase our productivity and optimize variety, we have been automating certain production processes in recent years.” Since March 2020, two additional otherwise strenuous activities have been carried out in a fully automated robot cell. Here, a ceiling-mounted Stäubli TX2-90 HE (Humid Environment) has taken over

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>
> **Reinhard Brunner**
> Master Cheesemaker and Junior Manager
> of the Plangger cheese dairy

the entire de-rinding of cheeses as well as the all-round coating of Sennkäse cheeses.

In the past, the hard rind was removed manually with a scraping iron. This took around 10 minutes per 600-millimeter block and required immense physical effort from the employee. Today, the robot does the job more accurately and economically than ever before.

The rind is removed quickly and precisely by a robot

3D path tracking enables the Stäubli six-axis robot to shave the rind off the unevenly shaped cheese wheels with great accuracy. The bonus is that, with a cycle time of around two minutes per cheese, the TX2-90 HE is approximately five times faster than a human doing the same job. Coating the smaller Sennkäse variety is even faster, with a cycle time of 20 seconds, which is equivalent to 600 kilograms per hour.

The first step of the process is the paring of the top and the perimeter. The cheese is automatically lifted from the belt by a vacuum suction gripper and placed on a rotary table. The robot does not begin its work until the cheese has been measured by laser, because the blocks are irregular in shape and no two are ever identical. The paring tool then begins to remove the rind. The Stäubli control system adjusts the distance between the cutter and the surface in real time. When the time comes for the underside to be de-rinded, the handling unit grips the cheese centrally, swivels it around, and places it on the second rotary table. Here it is measured by laser again before the final stage of the de-rinding can proceed. When this has been completed, the block is lifted and placed on the discharge conveyor belt.

Hygienic robot withstands cleaning lance

The already stringent specifications that apply in the food sector are taken to an even higher level in cheese production, due to the deliberate and targeted use of bacteria. Cleaning of the Plangger plant is therefore carried out with fat-dissolving, alkaline and acidic agents that remove milkstone, and with water heated to 55°C. The robot cell effortlessly withstands the intensive cleaning process with aggressive detergents delivered by a water jet lance.

Stäubli’s six-axis HE robots are HACCP-compliant, and their underlying hygiene concept is unique. Consequently, there is no viable alternative to the use of these robots in combination with H1 oil, the only lubricant approved for direct contact with food. They have a particularly resistant surface as well as the option for pressurizing the housing. Just a small amount of overpressure is enough to effectively prevent the penetration of water and cleaning agents. Washing and rinsing with running water presents absolutely no problem for these robots.

Compared to manual processing, the robot de-rinds much more uniformly, which has the additional benefit of producing less waste. The decisive factor here is the precision of the three-dimensional path tracking during the paring process.

Overall, the minimization of waste removal and much shorter cycle time achieved clearly have a net positive effect.

BAKED GOODS

Wiener strudel courtesy of Sisi and Franz

Factory manager Peter Baumüller: "We could completely fill a football field with a single day's production of our Viennese strudel dough."

At Weinbergmaier GmbH in Vienna, Sisi and Franz (as employees have quaintly named the two Stäubli robots) pack high-quality strudel dough within a cycle time of 1.5 seconds. The distinguishing features of the packaging line are the pair of ceiling-mounted robots and the absence of a protective barrier.

For even the most gifted amateur baker, pulling strudel dough is a real challenge. The delicate dough has to be thoroughly kneaded and stretched out as thin as possible.

The earliest known strudel recipe dates back to 1696 and originates from Vienna. Here, in the "pastry capital of the world," a well-known company has been manufacturing strudel dough on an industrial scale for decades. Weinbergmaier GmbH produces Toni Kaiser brand strudel dough on three

Sisi, a Stäubli TX2-60 robot, picks up four foil-wrapped units at a time and inserts them into the box presented by Franz.

The two robots, Sisi and Franz, work in perfect harmony around the clock during peak apple strudel season.

production lines. A single day's production would completely fill a football field. In order to meet the increasing demand from the catering sector for wide strudel dough, the line had to be equipped with a robot-assisted final packaging station.

The compact packaging station inserts four foil-wrapped packs of two sheets weighing 125 grams each into a cardboard box. Emerging from the cooler at a temperature of 6°C, the units to be packed arrive at the cell, are correctly aligned on a belt feeder and conveyed to a point within reach of Sisi, the first of the two robots. The TX2-60 picks up four film-wrapped units at a time with its shovel-shaped gripper.

Meanwhile, the second Stäubli robot is busy preparing the box. Franz, a TX2-60L, is slightly larger than Sisi and has a longer arm. The six-axis machine is equipped with a vacuum gripper, which it uses to lift a flat-pack box from a stack, swiftly guide it along four adhesive-dispensing nozzles, and press it into a negative mold. The box is now ready to be filled.

Highly dynamic while handling the product with care

While Franz prepares the packaging for Sisi, it is her job to carefully place the four packs held by her gripper into the box. In doing so, the TX2-60 has to operate with high dynamics, but also handle the product with care. Sisi has mastered the art to such perfection that any risk of damage to the delicate confectionery is eliminated. Finally, a tamper-evident seal is applied, along with an inkjet marking with the batch number and production date. The filled and sealed box then proceeds to the palletizing station on a conveyor belt.

Sisi and Franz usually work two shifts in the summer, which is peak apple strudel season, and sometimes even around the clock. And they do so at a phenomenal rate. By optimizing the final packaging line, Weinbergmaier has succeeded in significantly shortening the cycle time. This was achieved first and foremost because Sisi can now pick and place all four packs at once. Both robots run at 80 to 90 percent of their maximum speed and – if required – can outpace the upstream production line.

Safety features on the robots make a protective barrier redundant

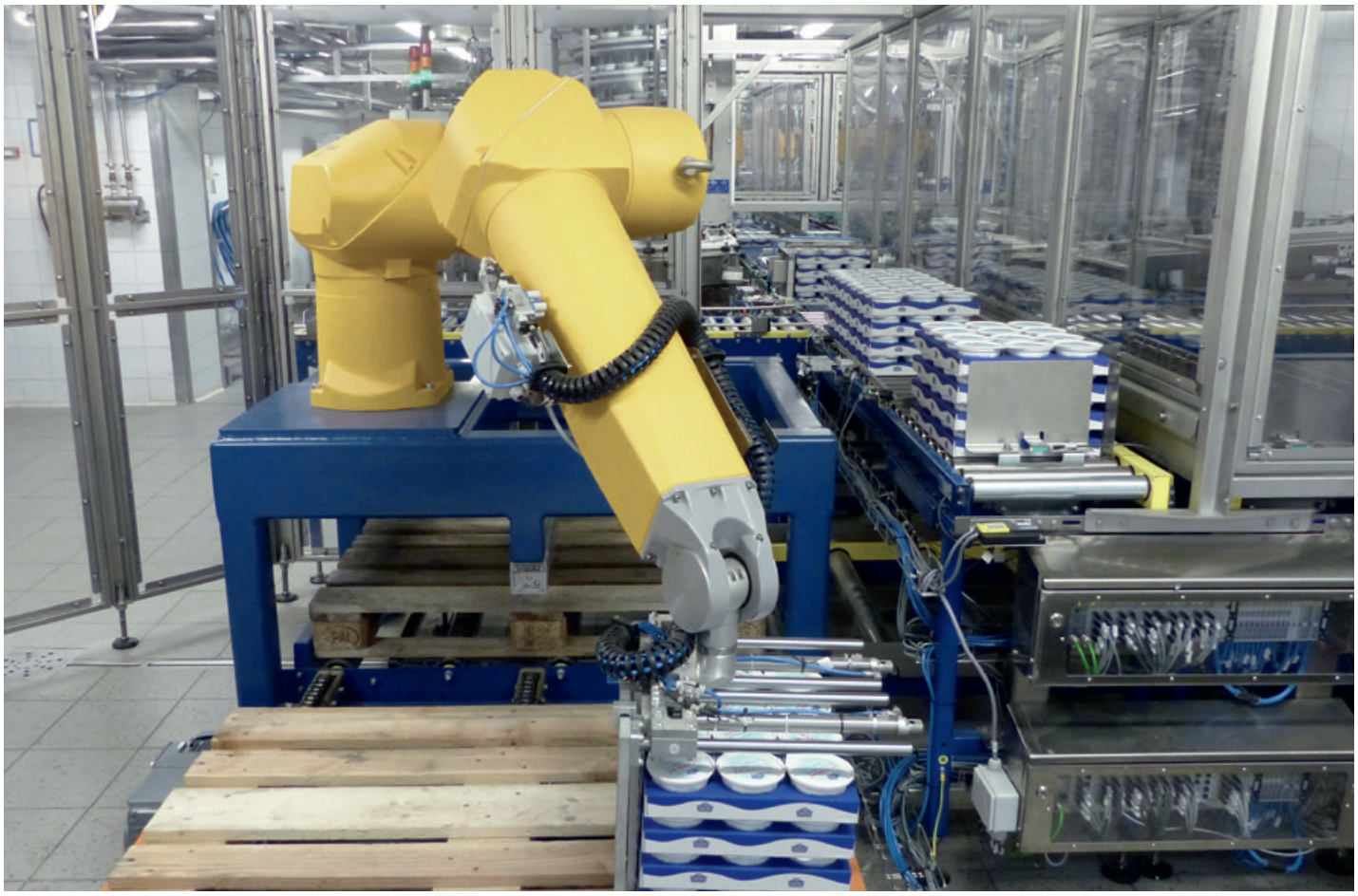
A major challenge had to be surmounted at the project planning stage for the system, namely the extremely limited space available. At first, it looked as if the proposed footprint might simply not be adequate. It was only by mounting the robots on the ceiling and dispensing with a protective barrier that the system could ultimately be realized.

The new Stäubli TX2 robot series with the innovative CS9 controller made a decisive contribution to the project's feasibility. The robots comply with the strict requirements of SIL3 and PIe safety standards. Their extensive safety features include functions such as Safe Tool and Safe Zone, which allow a specific area to be precisely defined and permanently monitored. If an obstacle is detected within the defined safety zone, the robot automatically comes to a full stop. This innovation allows the packaging line to be operated without a safety barrier.

With their encapsulated housing, streamlined contours and internal cabling, the Stäubli robots offer a superior level of hygiene – an important argument in favor of their deployment in the food industry.

Franz, a TX2-60L, takes a flat-pack box from a stack, guides it along four glue nozzles and presses it into a negative mold. The outer packaging is now ready to be filled.

Thanks to the superior safety technology of the Stäubli control system, it was possible to configure the entire packaging cell without a safety barrier.



DAIRY PRODUCTS

20 000 tubs per hour

Six Stäubli robots – specifically four SCARAs and two large six-axis machines – are dispatching a Czech dairy delicacy in record time. The speedy sextet manages the entire secondary packaging process, including palletization, of up to 20 000 tubs per hour.

Stäubli robots are the benchmark in the food industry. Users predominantly opt for robotic solutions from Stäubli even in secondary packaging, where hygiene requirements are significantly less stringent than in the handling of unwrapped foods. A prime example of this can be found in Choceň, a town 100 miles east of Prague in the Czech Republic. Choceňská mlékárna is a leading brand of spreads, yogurt and curd cheese. With 90 years of tradition behind it, the company is committed to the highest quality standards and therefore relies on highly automated and reliable production.

In seeking a solution for packaging 20 000 tubs per hour of a typical Czech dairy favorite, one thing was clear from the start: Even if there were cheaper solutions on the market, it was decided that the entire line would be equipped with Stäubli robots. As far as this company is concerned, Stäubli is the gold standard in food production, and management was not prepared to settle for a second-best solution.

Four SCARAs and two six-axis machines for maximum output

Installed in record time, the complete system with its 77-meter conveyor belt is controlled by a Siemens PLC. Four Stäubli TS60 SCARAs and two large Stäubli RX160 six-axis robots are positioned along the line. The task of the SCARAs is to pick the tubs off a conveyor belt as they leave production and place them at high speed, but without risk of damage, into cardboard box-

es that move past the station on a parallel conveyor belt. The boxes, each containing 12 units, are then transported via conveyor belt to the next station, where they are stacked four high.

These packs of four boxes, containing a total of 48 tubs, now reach a station where they are deposited onto wooden pallets. This demanding task is handled by two large six-axis RX160s. The robots must operate not only with high speed, but also with extreme care. They stack six four-pack layers per pallet, with each layer consisting of six boxes, for a total of 1 728 tubs per pallet.

Safe and fast high-output packaging

If a robot were to cause a collapse of the man-height stacks with an imprecise movement, the result would be chaos. The fact that this has never happened is due to the smooth, vibration-free trajectory. Only Stäubli's patented drive technology is capable of achieving this while maintaining such high dynamics.

Another key advantage of the system becomes apparent when it is time to switch between different product varieties. The delicacies come in different flavors as well as in two different tub sizes, 150 and 200 grams. Thanks to the flexibility of the robots, the changeover can be accomplished in just a few minutes – even if the grippers on the SCARAs have to be swapped. A quick-release system allows the gripper exchange to be performed literally with a flick of the wrist.

Like many other food manufacturers worldwide, the senior management at Choceňská mlékárna are highly satisfied with the performance of the robots. The six Stäubli machines have made a significant contribution to increasing production flexibility, enabling the line's output to be easily adapted to constantly increasing demand. And, as in all other applications worldwide, the robots excel in terms of precision and reliability.

More info

Two six-axis RX160s stack six four-tray layers per pallet, each layer consisting of six cartons. That makes a total of 1 728 tubs per pallet.

Four TS60 SCARAs pick the tubs off a conveyor belt as they leave production and place them in boxes on a parallel conveyor belt.

FINGER FOOD

Sandwiches made by a robot

U.S.-based Grote Company specializes in the automation of production lines that slice, fill and pack sandwiches. Up until now, however, the upper and lower halves have always been brought together manually. Recently, the supplier has managed to automate this process as well – using a Stäubli TX2-60 HE six-axis robot with wash-down capability.

Filling a sandwich is not a particularly arduous task. But it's a different matter when the job is being done on an industrial scale with a throughput of thousands of sandwiches per hour, because the raw materials are difficult to handle and process. This applies to slices of sausage and cheese as well as to tomatoes and lettuce leaves. In addition, stringent hygiene requirements must be complied with.

Headquartered in Columbus, Ohio, Grote Company sees itself as a technology leader in this area of food processing. Its design engineers have succeeded in bringing a groundbreaking innovation to market: the Robotic Sandwich Assembly Line, a robot-assisted system for sandwich production.

Sandwich production at a rate of one per second

At the heart of the assembly line is the six-axis robot, a Stäubli TX2-60 HE. A conveyor belt delivers the sandwiches to it as two halves – the bottom slice which is buttered and already has its filling, and the top slice which is only buttered. The robot grips the top slice and places it on the filling of the bottom slice. The sandwich is now whole. Next, the robot rotates the sandwich through 45 degrees and positions it diagonally on the conveyor belt.

It then passes to the last station, where the top and bottom slices are pressed together and the sandwich is given the typical longitudinal cut dividing it into two wedge-shaped halves. Up to 60 sandwiches per line and per minute can be produced in this way – an operation that was previously performed manually.

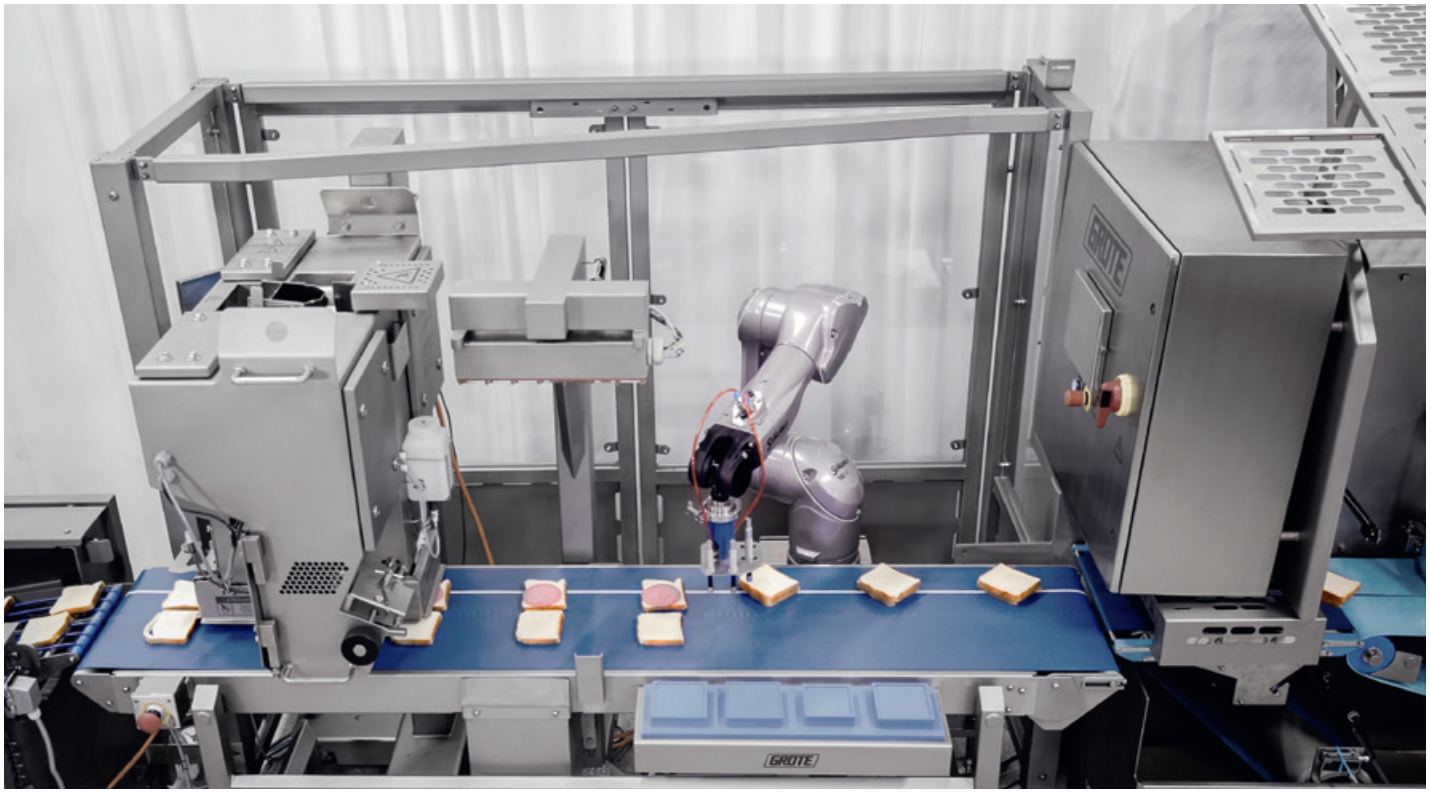
The entire production line is consistent with the principles of hygienic design. All edges are rounded, there are no dead spaces for debris to accumulate, and the sandwich line can withstand even the harshest cleaning procedures. To ensure maximum availability, Grote opted very firmly for a Stäubli HE robot – HE standing for "Humid Environment". The TX2-60 HE complies with protection class IP67, with all cables being routed inside the housing from pedestal to gripper.

The robot gripper is guided to its target by means of 3D image processing. The gripper itself is an inhouse development by Grote. It allows reliable handling of the sandwich top slice which is limp in nature and thus difficult to grasp firmly.

Fully automated, highly dynamic Production

Bob Grote, CEO of Grote Company, explains why this innovative system is equipped with a Stäubli robot: "In addition to its hygienic design, the high speed on the sixth axis was another convincing argument in favor of the TX2-60 HE. Sixty sandwiches per minute was the target. The robot reaches its limits here because, after all, it has to perform multiple motion sequences."

The Robotic Sandwich Assembly Line can be integrated into existing production



Plant overview: The Robotic Sandwich Assembly Line can be integrated into existing production systems or operated as a standalone plant.

systems or operated as a standalone plant. In either case, the user benefits from a high degree of automation combined with high flexibility. The robot can take on additional tasks or produce other sandwich variants without changes being made to the hardware.

Using a variety of pneumatic and mechanical grippers, the system achieves an impressive level of flexibility and is capable of handling both rectangular and round sandwiches as well as wraps. “We are convinced that robotics will play a major role in automated food production in the future,” says Grote. “We see ourselves as pioneers in this regard, and we intend to apply this principle in other areas, for example in the topping and handling of frozen pizzas.”

“In addition to its hygienic design, the high speed on the sixth axis was another convincing argument in favor of the TX2-60 HE.”

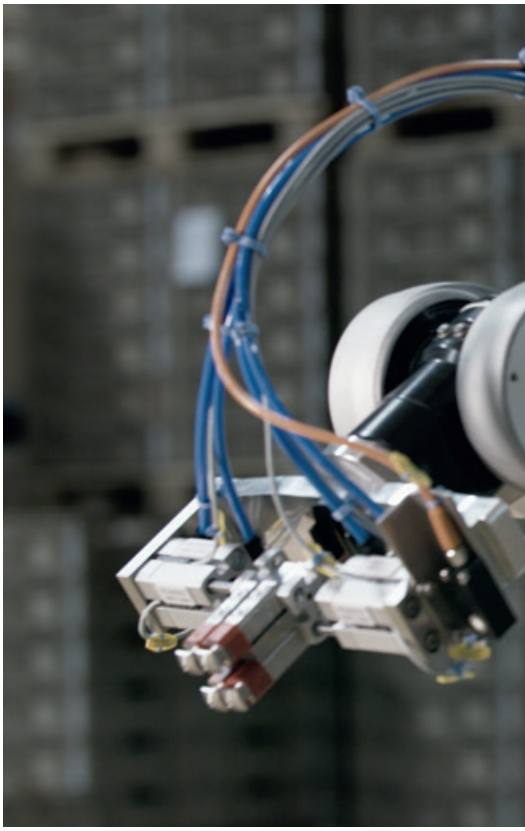
Bob Grote
CEO of Grote Company

More info

CONVENIENCE FOODS

HRC out of the starting blocks

In a pioneering HRC (human-robot collaboration) pilot project over a fixed period, Bischofszell Nahrungsmittel AG, a subsidiary of the Swiss Migros Group, has sought to achieve two objectives, namely the efficient production of food and the humanization of the workplace.

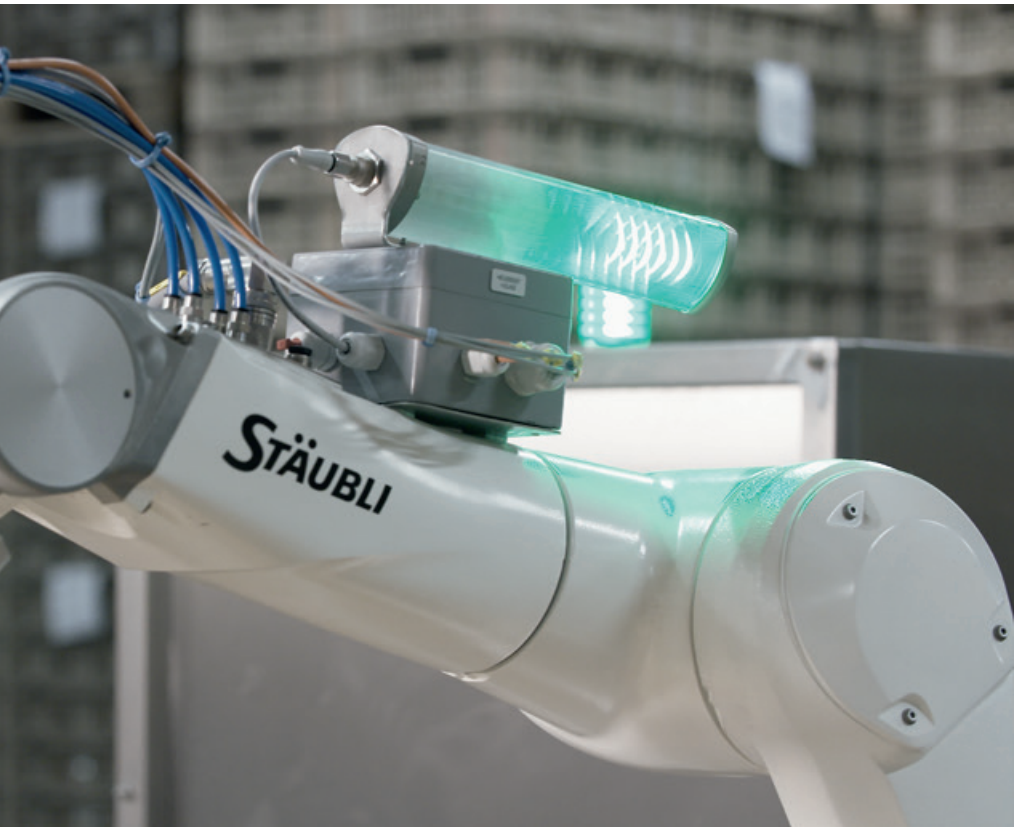


Raphael Merz, a fourth-year apprentice, was able to program the complete HRC application unsupervised after a brief training course.

A company based in the village of Bischofszell near St. Gallen specializes in the production of convenience foods. Customer demand for these delicious high-quality products is on a steep upward curve. In a pilot project, the company investigated whether human-robot collaboration (HRC) could increase capacity to the level required, while also reducing risks to its human workforce.

Specifically, the development team was designing a system that would assist in stacking trays of fully packaged convenience dishes in multiple layers on the trolleys used for transfer to the pasteurization unit. The task, when performed manually throughout, entails injury hazards and health risks for employees.

While the distribution of the ready meals on the aluminum trays and the placing of spac-



A light bar, similar to a traffic light, signals the operating status of the robot.

ers between the individual layers are among the more agreeable jobs on the packing line, stacking the large metal trays on the trolleys is by no means a popular activity. Handling the trays, which weigh at least five kilos, is strenuous work.

Efficient cooperation without the need for a safety barrier

The entire handling process was therefore considered a prime candidate for division between man and machine, who would be working in close proximity at a single compact station without the presence of a protective barrier. The more agreeable tasks would be assigned to the human employees, and the tougher operations involving risk of injury to the robot.

In consultation with Stäubli, the right robot for this human-machine interaction was identified in no time at all: a TX2-90L with CS9 controller. Unlike classic cobots, this collaborative six-axis machine has the necessary payload for the application.

The division of labor between humans and robots went without a hitch in practice. While a single human employee spaces out ready meals on an aluminum tray, the Stäubli six-axis machine picks up an empty aluminum tray and waits until its human co-worker has finished. The robot inserts the filled tray into the stacking trolley ready for the next layer. A new cycle can then begin.

With this pilot HRC application, the development team in Bischofszell has demonstrated that human-robot collaboration has enormous potential for many of the production and assembly lines within the Migros Group. Of course, some detailed improvements will have to be incorporated before the system can be rolled out in order to ensure its durability in a production environment. But the prime objective of demonstrating the benefits that flow from this pilot system has been fully achieved.

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