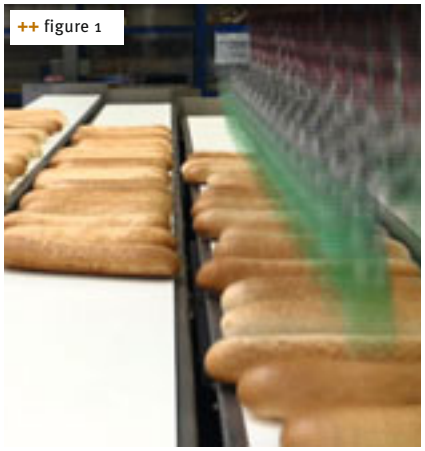
Automation for Africa

ASA AUTOMATISIERUNGS- UND FÖRDERSYSTEME HAS DEVELOPED AN AUTOMATION SOLUTION TO PACK HOT DOG BUNS FOR A BAKERY IN THE CONGO

++ figure 1



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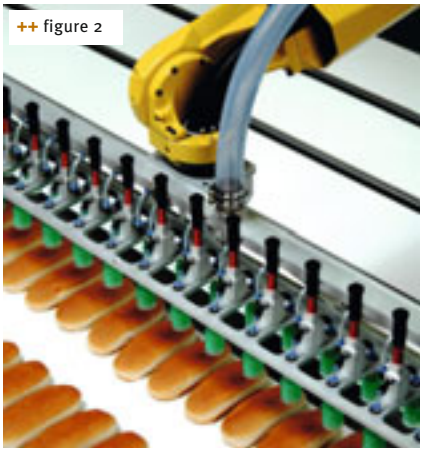
++ figure 1
Gripping buns reliably needs meticulous engineering

++ figure 2



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++ figure 2
ASA designed and built the 16-fold vacuum gripper

++ figure 3

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++ figure 3
A final check before packing the baked products

+ 100,000 hot dog buns per hour are not normally something for a flexible automation unit, but the solution suggested by the ASA Automatisierungs- und Fördersysteme Company, Mainhausen, convinced the clients in Africa. Instead of elaborate mechanisms, robots handle the hot dog buns between baking and packing in four production lines.

ASA CEO Mario Krämer recalls that the client worded the remit very simply: "I want to manufacture hog dog buns from 12 t of dough per hour." Only a plant running round the clock can cope with such volumes. The plant was to be designed to process a total of 300 t of dough per day. Logistically this means almost 100 HGVs per day transporting the hot dog buns away.

Managing the plant's technical design and configuration ranged from simple to tricky. ASA's engineers were asked questions such as: "What should the plant look like? How should the buns be packed? How many variants should there be?" At least the buns are already pre-baked when they come into the ASA plant's working area. One fundamental question was quickly solved. The volume of 100,000 buns per hour is divided among four, more or less, identical plants each handling 25,000 buns per hour.

References are required

The fact that ASA was able to mention reference plants in the chocolate industry and could show them a customized simulation in the run-up fitted the picture well for the clients. The only problems were that chocolate bars are flat and always have the same shape, and above all it was important that they didn't fall over when being carried around. Not so the hot dog buns! Due to the fact that they are circular and lightweight, they easily rotate or turn over. At any rate they never lie in a clearly defined position on the conveyor belt as the robot would like them to. The buns are about 200 mm long and have an average weight of 120 g.

The buns are taken from baking trays measuring 1.2 m x 1.2 m on which they are baked in five rows of 16 buns each. Conventionally the buns would have been pushed off the baking tray, sorted using more or less elaborate equipment and then sent singly to the packing machine made by the Wolf Verpackungsmaschinen GmbH Company, Lich-Birklar, Germany. Such equipment, which is usually format-dependent, is not very easy to set up and requires a very high degree of skill when there is a possible change of format. The buns are lined up at a kind of "alignment knife" upstream of the robot station, and correctly positioned for gripping. The robot then takes the rows of buns and puts them down on the conveyor belts leading to the flowpack machine. At the same time the buns are positioned so they can be carried via flexible slat-band belt conveyors directly to the individual packing point.

Therefore the decision in favour of a robot was taken quickly. According to Mario Krämer: "In our view, using a robot to replace the mimic is the best, safest and most elegant way to solve the task." In the chosen combination of a robot with conveyor technology, the plant concept is entirely transferable to other products with similar numbers of items and roughly comparable properties. Mario Krämer says, "The gripper is the only thing that is product-specific."

In the design of the 16-fold gripper, the ASA developers showed what they can do. Even buns weighing only 120 g have a tendency to obey centrifugal force when the robot swivels at almost maximum speed.

The design and development side is not the only place where Krämer has in-house competence. ASA consciously placed importance on a high level of vertical manufacturing integration. Firstly the pathways are short if there are modifications, and secondly the quality is then right throughout the whole plant. According to Krämer: "It can be said that we built the entire plant ourselves, with almost no bought-in parts." In this respect, standard components such as robots,

controller modules or conveyor drives count as part of the "ready-to-use products" that are procured with the experience from many plants. This also includes the company's own slatband chain system in the "Carryline" series, which has proved its worth in many plants. Based on all this experience, ASA also makes the control systems itself, including programming and visualization. The switchgear cabinets are also fabricated in-house.

Robot controller

The plant is controlled by a central SPC (stored program controller). The robot control operates at a subordinate level. Reach and speed were the decisive criteria in choosing the Fanuc Robotics M-20iA. The robot in the long-arm variant has a reach of 2,010 mm. The initial plan was to build a "classic" ASA Pick&Place cell with a suspended robot, as Mario Krämer remarks. "In our cells with LR Mate or Delta robots, e.g. the M-3iA/6S, the robots are normally in a suspended arrangement. Our own and our clients' experience with this has been good." However, when engineering the hot dog plant it became apparent that the reach could be extended by mounting the robot on a pedestal. Krämer says, "In the chosen configuration we also make better use of the speed." Such limits are frequently explored in ASA's engineering by using the simulation technique. Referring to a point that is important from the life cycle point of view, Mario Krämer says, "Although in most cases we go to the limit with plants like this, we never go beyond it. The ultimate aim is for the plants to give long-term reliable operation as well." Since the four hot dog plants were going to Africa, reliability was doubly important.

The same also holds true for the sensor systems that are part of the plant. Positions are scanned by simple sensors. Cameras and line-tracking were avoided. The robot's functions can be monitored and serviced via remote maintenance. Mario Krämer says, "If there really is a problem on site, we access the robot through a VPN (virtual private network) tunnel and look at the problem."

Yet another example of a lasting simplification of maintenance at a small added cost: conveyor belts with zip fasteners. "This solution greatly simplifies a change for the operator." Old belt out, new belt in, job done! No dismantling of the mechanism. All that needs doing is to adjust the drive and return rollers so the belt runs on track. Mario Krämer thinks his company's future lies in plants like this: "The experience from conveyor engineering and handling technology is there. We now have intelligent symbiosis from both areas." +++