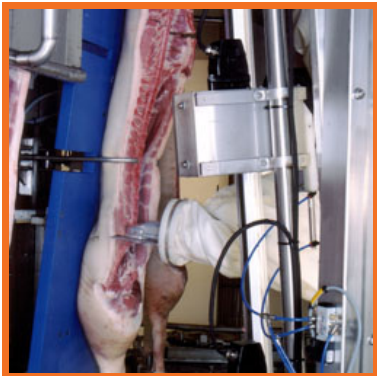


Robot optimizes cutting of pork sides

Starting point / Task definition

In a European Commission-sponsored project for automated pre-cutting of pork sides, Gilde Hedmark og Oppland Slakterier BA (Gilde Hed Opp) saw for itself how efficiently robotic systems can operate in the meat processing industry today. In the course of the project, the company integrated a KR 125 six-axis jointed-arm robot into its production. The main requirements were cost-effectiveness, flexibility, precise anatomical cuts, and a throughput of at least 400 pork sides per hour.

Implementation / Solution



For optimized pre-cutting of the pork sides, which weigh from 70 to 120 kilograms each, the KUKA robot uses a circular cutter, and can “see” by means of an image recognition system. The robot begins with a curved cut along the contour of the backbone, also called the curved loin cut. This is followed by two horizontal cuts, one over the shoulder and one at the ham, and the special Norwegian Mørbrad cut, in which the robot changes the angle of the circular cutter from 15 to 20°. The cutting paths are programmed via the control panel of the robot controller as points or lines, and selected or deselected with the aid of the vision system.

The pork sides, after hanging overnight in a refrigerated hall, are moved past the robot on the left and right sides on a two-track overhead conveyor. This means that the robot can operate continuously by working to both sides, thus saving time. Both of the conveyors have been equipped with locating fixtures and an image recognition system including two cameras, as a result of which the KR 125 does not have to wait for evaluation to be carried out by a single vision system. Before this, however, a mechanical device verifies whether the pork sides which are hanging on the individual hooks have their open sides facing towards the cameras. If this is not the case, the hook is automatically rotated. The pork sides then stop at a defined processing position, where they are mechanically located by lateral arms. In addition, a locating plate equipped with suction cups moves up to the pork side from behind, and a neck holder installed below swings up. The image recognition system then measures four points on the backbone, the position of the hip bone, and two points on the leg. The locating fixtures remain in position during measuring and cutting. Only the neck holder swivels away while the vision system is working, or if the circular cutter comes too close to the neck holder during the curved cut. The locating fixtures are released as soon as the KR 125 has finished its task. The pork sides then move on the overhead conveyor to an intermediate buffer, which makes it possible for the manual finish-cutting, which is carried out later, to process larger quantities in a single batch, and with more flexible scheduling.

System components / Scope of supply

- :: KUKA KR 125 robot
- :: PC-based KUKA robot controller, including control panel with familiar Windows interface
- :: Image recognition system equipped with two cameras (E + V Technology GmbH, Oranienburg, Germany)
- :: Overhead conveyor and locating fixture (Banss Schlacht- und Fördertechnik GmbH, Biedenkopf, Germany)
- :: Circular cutter (Freund Maschinenfabrik GmbH & Co. KG, Paderborn, Germany)
- :: Robot programming
- :: Commissioning



Number of report:
R 232

Industry:
Foodstuffs, beverages

Application:
Cutting

Product:
Robots
High payloads (100-240 kg)
Controller
KR C (Robot Controller)

Implementation:
25.11.2002

Customer:
Gilde Hedmark og
Oppland Slakterier BA,
Rudshøgda, Norway

Results / Success

:: High cost-effectiveness

One major benefit of the robot is that it can carry out the curved cut along the backbone. This results in recovery of about three percent more bacon, shortening the payback period to just over a year. With conventional automation equipment neither this curved cut nor the Mørbrad cut would be possible. Moreover, conventional process equipment is significantly more expensive than robots, and is designed for outputs of over 1,000 sides per hour, which is more than Gilde Hed Opp produces. It would also require the use of more personnel, likewise resulting in lower cost-effectiveness.

:: Higher quality meat

The robot cuts up each of the pork sides into six parts by means of four cuts. Since these are generally pre-cuts and not through-cuts, in this processing stage each side remains as a single unit. This makes it easier to track the goods, and even more importantly, it results in higher quality meat. The meat is better protected because the whole sides of pork remain on the conveyor during the subsequent intermediate storage, after which they are finish-cut, packaged and shipped. Furthermore, the KR 125 always produces consistent cuts, meaning higher processing quality compared to manual work. What is more, cutting with its saw blade it executes the cuts without the film of grease and ground-up particles which is typical with manual cutting.

:: Excellent flexibility

The extraordinary flexibility of jointed-arm robots, which is based on their six axes and ease of programming, also makes it possible to cut both thicker and thinner as well as larger and smaller sides of pork.

:: Compliance with strict hygiene regulations

The KR 125 is protected against contamination by an easily-removed elastic wrapper. This is washable, thus conforming to the strict hygiene regulations in the foodstuffs industry. The same is true of the easy-to-clean stainless steel booth in which the robot controller, the energy supply system, field bus system and additional peripheral devices are accommodated.

:: High availability

To further enhance the system's already high availability, Gilde Hed Opp has invested in teleservicing. Modem connections have been established for this purpose with KUKA Roboter in Augsburg and with the supplier of the vision system.



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