Robotics in food manufacturing processes

Identification

Key words  robotic, packaging, handling, hygiene, flexible automation
Latest version 2012/07/17
Completed by DIL

How does it work?

Primary objective
Robots are used for the automation of processes in food manufacturing to save costs and to increase productivity. The industrial robots currently available are very flexible automation tools for different types of processes, e.g. packaging or slaughtering. The robots can be used to replace heavy and dangerous manual work especially in harsh environments. They can contribute to an improved hygienic safety of food products.

Working principle
Application of robotics together with highly developed image processing is one opportunity to achieve a higher degree of automation for processes carried out manually so far [1,2,11]. Industrial robots are very flexible automation tools and can be easily adapted to new tasks and product dimensions. Besides cost savings and productivity improvement by flexible automation, robots can be used in food processing to relieve humans from monotonous and heavy work at unfriendly environments e.g. very low temperatures [6]. With respect to hygienic requirements in food processing robots are often covered by a washable jacket; however robots in wash-down design are also available [4]. Additionally, robot grippers for food handling under hygienic conditions are required [3,7], see Robotics for packaging.
A main aspect which has to be considered in food robotic is the sensor technology to equip the robots with more possibilities for interacting with their environment. Optical systems and image processing are tools to enable the robots to ‘see’ the work they have to do. This includes detection of objects (position and orientation) for grasping of products. Additionally, force sensors are used to control handling processes, e.g. contact with the product.
So far, application of robots in food industry is widely spread at the end of processing lines like packaging (Robotics for packaging) and palletizing so far [6]. Examples of robot applications in food processing apart from packaging are the automated slaughtering of pork carcasses and deboning [5,10]. Additionally, robots are already used in baking lines to handle hot trays.
It can be expected that sensor techniques will be continuously developed during the next years, e.g. recognition of shapes using 3D imaging, and further applications will be realizable for automation in food processing using robots [8].

Images

Additional effects
automated quality inspection and sorting, higher output rate and a more continuous operation
higher hygienic safety of food products

Important process parameters
output rate, hygienic requirements, labour costs and productivity, availability of sensors

Important product parameters
size, surface properties, mechanical sensitivity [9]
What can it be used for?

**Products**
individual solid and semi solid foods pieces or packed food products

**Operations**
see sheet: Robotics for packaging
palletizing, de-palletizing, slaughtering, general handling of food pieces

**Solutions for shortcomings**
technology for a flexible automation of processes during food manufacturing considering hygienic aspects

What can it NOT be used for?

**Products**
liquid products

**Operations**
very sophisticated manual operation sequences, e.g. manual peeling

**Other limitations**
amautomated quality control of each product has to be realised

**Risks or hazards**
possibility of product cross contamination due to improper hygienic design, damaging and loss of product during robot handling

Implementation

**Maturity**
industrially available for some food processing operations, especially packaging, and single other processes, e.g. slaughtering, implementation of robots is widespread in other industries, e.g. car assembling

**Modularity/Implementation**
technology can be easily implemented in existing lines (packaging), often re-design of lines considering robot-based automation may enable higher cost savings and productivity

**Consumer aspects**
Consumers perceive the technique as save

**Legal aspects**
Machinery Directive 2006/42/EC
Regulation (EC) No 1935/2004 (materials in food contact)

**Environmental aspects**
not applicable

Facilities that might be interesting for you

<table>
<thead>
<tr>
<th>Title</th>
<th>Institute/company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auditorium IRTA</td>
<td>IRTA</td>
</tr>
<tr>
<td>Clean room – Histocell</td>
<td>Noray</td>
</tr>
<tr>
<td>Video observation system for market research and product development tasks - Keki</td>
<td>NAIK EKI</td>
</tr>
</tbody>
</table>

Further Information

**Institutes**
DIL, DMRI – Danish Technological Institute, Centre of Robotics and Automation

**Companies**
ABB, Kuka Robotics
References


Source: