Grippers for automated food handling (food packaging)

**Identification**

**Key words**
robotic, packaging, gripper, handling, hygiene

**Latest version**
2012/07/17

**Completed by**
DIL

**How does it work?**

**Primary objective**
Grasping, transport and depositing of food pieces in the automated packaging of food products by robots equipped with grippers to save labour costs and to improve hygiene

**Working principle**
A critical device of handling automation (Robotics in food manufacturing processes) by robots is the gripper which directly contacts the food product [7,8]. Quality control and hygienic aspects have to be considered in gripper design. Because standard grippers known from other robot applications do not meet the special requirements for food handling, e.g. broad variability of shapes and hygienic design, new gripping concepts are necessary. (Vision system for robot guidance and food inspection)

Mainly two gripper principles are currently found in the industry for food handling.
1) Vacuum grippers use a local vacuum space between the upper product side and gripper. Such a gripper has the advantage to be independent of the shape of the whole product. A drawback may be the vacuum generation system where suction of moisture or product residuals may lead to a contamination of internal ducts. New solutions for vacuum grippers meeting the high hygienic requirements of food handling have been developed [2].
2) Mechanical grippers have a closed gripper design and can be used for hygienic sensible foods. However, there is limited size variability of such a gripper principle.

New gripper principles have been developed also for use in food handling.
- One example is the magnetorheological gripper [5,6]. In this gripper, a special substance for which firmness can be controlled by a magnetic field is used enabling a broad variability in size and shape of products to be handled.
- Air flow grippers according to the Bernoulli-principle may open additional opportunities for handling of special foods, e.g. very sensitive products, as they allow for non contact handling [1].
- So called ‘cryo grippers’ generate the holding forces by local freezing of product surfaces. Soft grippers with ‘fingers’ can handle surface sensitive products [3].

The mechanical grippers can be equipped with force sensors to detect and control contact forces and to react on these signals during gripping, to avoid loss or damage of product [4].

**Images**

**Additional effects**
- removal of hard and monotonous work at the end of production lines, high reproducibility of the packaging process, e.g. adjustment, visual quality inspection and sorting by camera systems and image processing,
- weighing, higher output rate, a more flexible production line, shorter changeovers and a more continuous operation
Important process parameters
packaging rate and handling distances

Important product parameters
properties of the products to be packed like shape, mass, surface properties, texture, colour, variation in shape, gripping opportunities, separation of products

What can it be used for?

Products
solid and semi solid food pieces, unwrapped and wrapped

Operations
handling, positioning, packaging

Solutions for short comings
technology for a fast, flexible, reliable and hygienic food packaging process

What can it NOT be used for?

Products
very small pieces and powders, fluid products, very soft products

Operations
packaging of products described above

Other limitations
most commercial grippers are limited to a relatively small product

Risks or hazards
• possibility of cross contamination of products in case of improper gripper design and operation
• packaging of products which do not fit quality requirements
• product damaging
• loss of products during transportation by the robot

Implementation

Maturity
industrially available for many food products, some limitations in handling of unpacked products which are hygienically sensible, e.g. meat pieces; widespread in other industries, e.g. pharmaceutics

Modularity /Implementation
widespread for packed foods as secondary packaging system (consignment), several applications for primary packaging

Consumer aspects
Consumers perceive the technique as safe

Legal aspects
Machinery Directive 2006/42/EC
Regulation (EC) No 1935/2004 (materials in food contact) ISO 10218

Environmental aspects
saving cleaning and disinfection materials

Facilities that might be interesting for you

Title
Auditorium IRTA
Clean room – Histocell
Video observation system for market research and product development tasks - Keki

Institute/company
IRTA
Noray
NAIK EKI
Further Information

Institutes
DIL, SP

Companies
ABB, Bosch Packaging Systems

References

Patents (examples):

Source: