

# Hygienic design safeguards quality

PACKING MACHINES THAT COME INTO CONTACT WITH FOODSTUFFS MUST BE CLEANED REGULARLY. MACHINES CONSTRUCTED IN ACCORDANCE WITH HYGIENIC DESIGN MAKE THESE OPERATIONS MORE EFFICIENT, FASTER AND SAFER



++ figure 1

Some components, e.g. printing and labelling modules, are unsuitable for mechanical cleaning. In the cleaning plan Multivac recommends that such modules should be cleaned manually beforehand, then enclosed in watertight packaging

**+** Handling food demands the greatest possible care, especially in the area of industrial packing. Machines and plant must be cleaned regularly to remove adhering materials and product residues. This work is often still carried out by hand. However, this is time-consuming, cost-intensive, and not always reliable. This is why some users rely on integrated automatic CIP (Cleaning-in-Place) and SIP (Sterilization-in-Place) systems. Packing plants with CIP systems involve more elaborate construction, and so do those built in accordance with Hygienic Design, but at the same time they are an important component to safeguard the quality of foodstuffs. These systems enable reproducible cleaning results that can be documented. Automatic dispensing systems can use cleaning agents more efficiently. For example a study published in January 2012 by the German Engineering Association (Verband Deutscher Maschinen- und Anlagenbau e.V., DMA), Frankfurt/Main, Germany, revealed that the proportion of time occupied by cleaning in the food industry was 20–30%. According to the study, cleaning times depend for example on the level of technology of the production plant. Against this background, automated cleaning can help to increase the production plant's availability, since at least parts of the cleaning operation can be integrated into the on-going production process. Regular thorough cleaning can also be

seen as a kind of “preventive maintenance”, because it allows the operating lifetime of certain components in a packing machine, e.g. the transport chain, to be increased considerably.

## Avoiding corners and edges

At the iba in 2012, the Bizerba GmbH & Co. KG in Balingen, Germany, presented a new hygienic weighing machine that eliminates bacterial contamination when weighing perishable foods. The problem of dirt accumulating at transitions, edges and corners often occurs with traditional weighing machines. Bacteria quickly become a safety risk for perishable foods, especially those without preservatives. The new hygienic weighing machine intentionally omits a bell bridge and uses tubes over whose curves the water drains away, i.e. there is no build-up. The weighing machine conforms to the European Hygienic Engineering and Design Group (EHEDG) Hygiene Guidelines and achieves Protection Class IP69k, i.e. it is protected against dust, powerful water jets and aggressive cleaning media. Dieter Conzelmann, Industry Solutions Director at Bizerba, explains that “Hygienic Design is an integral part of the plant's concept and an important distinguishing feature compared to competitors: the CWP Neptune dynamic check-weighing machine is particularly distinctive in this respect.” Good accessibility to all the components for cleaning is



++ figure 2

The integrated Cleaning-in-Place system ensures precise, reproducible hygiene. Approx. 1.3 m<sup>3</sup> of water is used for each cleaning cycle on standard thermoform machines with an average machine length of 2.40–6 m

important. That's why the CWP Neptune has an open frame design: the number of corners, edges and recesses is reduced to a minimum. Thus there are few dead spaces in which dirt, water and cleaning agent residues could accumulate.

#### Greater design effort

Gerald Schubert, Managing Partner at the Gerhard Schubert GmbH, Crailsheim, Germany, explains that "Hygienic Design is a central topic to which we pay great attention when developing new modules and continuously improving existing ones, regardless of the respective application." Adhering product deposits can occur, especially when producing sticky products, and these must be removed at regular intervals, which necessitates hygienically appropriate design for machines that are used in sensitive areas.

Andreas Hollmann, Executive Director of the Ishida GmbH, Schwäbisch Hall, Germany, points out that "For us as mechanical engineers this means first of all greater design expenditure, and thereafter higher fabrication materials costs as well, e.g. for full-penetration weld seams and sealing materials. A customer cannot distinguish between good and bad hygiene design on the basis of an offer or specification. Nonetheless we must be convincing with a higher price." The electronics is the main area that needs to be protected from cleaning chemicals and moisture. But according to Hollmann, "The pneumatic components, e.g. cylinders, must also be protected as far as possible, or an appropriately protected version must be used. Linear movement axes are often not available as protected versions; protected installation is then the only remaining option. Belts and tapes are a special case. Although they can be installed as a resistant version, it is often necessary to dismantle them to clean them hygienically on the inside and in the suspension as well."

That's why at Schubert the switchgear cabinets are consistently installed above the production level. Schubert says: "The

requirements differ depending on the production environment and the prevailing cleaning processes. Sometimes the protection requirements are limited to machine components located on and under the production level."

The machines from the MULTIVAC Sepp Haggemüller GmbH & Co. KG in Wolfertschwenden, Germany, are divided into various areas depending on how they come into contact with the foods being packed. As a basic principle, all Multivac's automatic packing solutions conform to the Multivac Hygiene Design. Valeska Haux, Vice President Corporate Marketing at Multivac, explains that "Both the machine design and the materials used must be chosen such that cleaning fluids can drain away and no residues of dirt remain adhering." For example not all printing and labelling modules are suitable for mechanical cleaning, nor are some vacuum pumps, gas ▶

#### What is Cleaning-In-Place?

The key features of CIP are the optimum consumption of water, detergents, disinfectants and steam. In contrast to manual cleaning, there is no need to dismantle the plant. Downtimes due to cleaning are also significantly reduced, and plant efficiency is increased. Manual cleaning steps can be reduced to a minimum or avoided altogether. This increases employee safety, since they no longer come into contact with corrosive or hot cleaning agents. The hygiene status is also increased, because CIP cleaning programs are carried out at pre-defined intervals and cannot be forgotten. Cleaning is altogether more reliable since it is always carried out using the same parameters. Moreover the cleaning is automatically documented to enable the hygienic state of the production plants to be proved at any time, e.g. for audits. +++

### What is meant by Hygienic Design?

The important requirements of standards such as DIN EN 1672-2 include the ability to clean down to a microbiological level, easy access for inspection, maintenance and cleaning, the sealing of cavities and avoidance of dead spaces, and design measures to prevent liquids accumulating. Due to their design, the thorough cleaning of critical areas on the majority of packaging solutions in the past was possible only with a relatively large effort. For example as a rule the transport chain must be removed to enable it to be cleaned completely. +++

analysis sensors and suction extraction units. In the cleaning plan Multivac recommends that such modules should be cleaned manually beforehand, then enclosed in watertight packaging.

Special industry-specific requirements also apply to the development of automation components for the food and packaging industries. In addition to the statutory requirements regarding permitted construction materials or the use of lubricants, the manufacturers of automation components use comprehensive systematics to ensure Hygienic Design. By using specific standard or customised components and



++ figure 3  
The number of corners, edges and recesses on the check weighing machine was reduced to a minimum so no dirt and residues of cleaning agents could accumulate



++ figure 4  
Design measures include avoiding external threads, fabrication from stainless steel or the consistent avoidance of cavities

systems, a search is made for the appropriate handling solution for a specific requirement in each case: from non-contacting grippers (using vacuum suction devices that lift the baked item in a suction air flow) and the transport of sensitive baked items to the packing of sticky products.

### Certification provides security

In the food processing area there is a series of standards that differ in various organisation units or countries. One example of this is Directive 85/572/EEC, which applies in Europe. There are laws here which must also be obeyed, e.g. the Machinery Guideline EN ISO 1672, as well as guidelines issued by the Employer's Liability Insurance Associations. There are also guidelines for different kinds of food contact zones. Gerson Henning, Industry Sector Manager Food & Packaging at the Bosch Rexroth AG, Lohr am Main, Germany, explains that "By certifying our components in accordance with the European Hygienic Engineering & Design Group Guidelines, we have an important basis on which to comply with all the criteria. The use of stainless steel and novel high-quality plastics such as polyether-ether-ketone (PEEK) enables our products to be used in the various wet and spray areas of the food industry. We also support our customers in durability analyses." Special materials together with the design of the components and systems enable them to be used even in areas that are cleaned with high pressure, and they are compatible with most of the cleaning agents that are used. That saves the user of the machine a lot of time in the cleaning operation, and thus also saves costs. Due to the Hygienic Design, pneumatic components can also be used in a decentralized way, directly on the machine. That increases its performance while at the same time saving energy due to a smaller consumption of compressed air and smaller dead volume. Bosch Rexroth pneumatic components for use in the food industry satisfy high demands in relation to cleanability. For example EHEDG-certified components are designed in such a way that they have high resistance to most chemicals, and fulfil the requirements of the relevant protection classes.

### European Standards

At the same time, the EHEDG Federation's criteria and certification provide machinery manufacturers with certainty

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Hygienically designed pneumatic system components made from corrosion-resistant materials – in this case an EHEDG-certified valve unit and stainless steel cylinder – simplify the cleaning of machines and plants in the food industry

when they use hygiene-compatible components. The European Hygienic Engineering & Design Group is an experts' association of machinery and components manufacturers and expert professionals from the food industry, and also includes research institutes and health authorities. It supports the European legislators and their demand for the hygienic handling, processing and packing of foods by means of hygienically designed machines and their use in a hygienic environment (EEC Directive 2006/42/EU for machines, and EN 1672-2 and EN ISO 14159 for hygiene requirements). In early February 2013 the German Engineering Association launched the EHEDG work group "Hygienic Design in the Baking Industry", chaired by Dr.-Ing. Gerhard Hauser, with

a kick-off meeting in Frankfurt. The experts taking part want to draw up a generally valid, practically applicable set of rules for the baking industry that will be devoted in particular to the cleanability of plant and equipment and to process hygiene, as well as to hygienically appropriate storage and cleaning processes in bakeries. The plan is for the future EHEDG guideline to give practical help with regard to the hygiene requirements applicable to plant and equipment in industrial bakeries, whereby the special challenges facing the industry need to be taken into account, for example the large diversity of products, the overlap of dry and wet areas, numerous recontamination hazards, and special hygiene risks in the area of delivery and packaging. +++

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