Ecocaps

Hygienic can protection without sacrificing speed

A unique solution allows the beverage industry to cover can tops with heat-sealed aluminum foil caps. The company which patented this solution, Ecocap's, is now able to guarantee a high level of reliability even on high-speed bottling lines, thanks to automation solutions supplied by Omron.

Several years ago the beverage industry discovered a new way of packaging products: cap-protected cans. It involves applying a heat-sealed aluminum foil disk to the tops of cans, and has become a fairly widespread solution which allows beverage multinationals to market products that are safer from a health and hygiene point of view. This specific capping process is based on technology named after its developer, Ecocap's, headquartered in Casalecchio di Reno near Bologna, which has filed an international patent on its innovation. The system consists of two basic elements: an application machine and a preformed aluminum foil disk which is applied to the lip of the can.

It is a combination on which Ecocap's has built a successful business model, thanks to automation support provided by Omron. Up to 90,000 cans per hourCapping machines developed by Ecocap's are designed to support high-speed bottling plants (up to 90,000 cans/hour). They are already used fairly widely by all of the major beverage groups, including San Pellegrino, Heineken and San Miguel, which have decided to take action to curb the problem of bacterial contamination of cans. The idea is to complement the packaging process by sealing the lips of cans with a pure aluminum foil disk (37 microns thick). "Compliance with the best possible health and hygiene conditions," explained Stefano Cassoli of Ecocap's, "is based on physical prerequisites: unlike plastic covers, which have different breathability properties compared with the body of the can, aluminum covers match the rest of the container and don't create the conditions for condensation and mold."
In addition, the Ecocap's solution offers a whole host of other advantages. For one thing, the heat-sealing process is carried out using non-toxic food-grade lacquers (instead of glues which are more hygroscopic and thus susceptible to mold growth). The caps can be recycled with the can, and are physically attached to the can top, thus providing a secure seal. In addition, the aluminum foil can be printed, so it is possible to create coordinated packaging which enables the product to be recognized not only from the side, but also from above.

Fully reliable temperature regulation

From a technical point of view, Ecocap's has sought to leverage its considerable experience in the field of automated machinery

— and packaging machinery in particular — in order to bring about an evolutionary leap forward in the field. The company's stated objective was to devise a cap heat-sealing system that delivered close to 100% reliability. "Our priority is to keep the machine operating at all times," said Carlo Innocenti of Ecocap's. "These machines work downstream of lines that operate at very high speeds, so any downtime — albeit only a few minutes — can be extremely costly to the end user. That's why we have gone for reliability first and foremost." Hence the decision to rely on an Omron integrated automation system, above all because it provides the high level of control needed to heat-seal the caps onto the can tops. According to the company management, this is a rather delicate operation that is carried out inside a carousel containing 60 sealing and forming heads. Here, the die-cut caps are picked by four loaders and placed against the cans which, after being lifted and shaped, are mechanically crimped at high temperatures until the sealing process is complete. All of these operations are synchronized down to the millisecond (the transfer time is 40 ms) with the aid of mechanical tracking.

Centralized control

Multi-channel temperature regulation is a fundamental condition for precise and accurate cap sealing. In fact, heat-sealing is performed via polymerization of the lacquer at exactly 230°C (polymerization time is 0.6 seconds), all in an environment that is continuously rotating through 50-55° with the tips (of the sealing head) at about 60°. Each of the 60 sealing heads are further provided with double resistance and thermo-regulated by means of Omron EJ1 units, which ensure the requisite level of reliability, particularly in view of the high thermal stresses to which the components are subjected. The possibility of using a family of temperature controllers that connects directly to the central processing unit of the PLC — and can therefore be centrally controlled via a touch-screen panel (NS Series) — guarantees a clear operational advantage. In this sense, Omron EJ1 temperature controllers represent a fully integrated solution that presents the end user with immediate and comprehensive event information and remedial measures. The entire mechatronic system is controlled by Omron, including motor management by means of five Omron V1000 Series inverters. The machine is designed to effect on-the-fly format changeovers via a brushless motor control, which ensures that the cans are correctly positioned for picking. The whole process is controlled by an Omron CJ1 PLC (with data transmission via DeviceNet for remote I/O devices and via Modbus for the EJ1 devices), complete with an NE1A unit for ad hoc safety parameter setup. Furthermore, the PLC serial port is connected to a GSM/GPRS modem for remote support functions to and from the manufacturer, all without tying up the company phone line.

Sysmac and NJ, the evolution of the species

The development of a new machine for the energy drinks market gave Ecocap's the opportunity to adopt a new automation model based on the Sysmac platform. The idea was to develop a system for bottling up to 20,000 cans/hour with motorization of all stations using a single high-speed bus (EtherCAT), which facilitates wiring by providing a single type of connection and a single access point for all connected loads. In this case, the use of a PC platform such as Sysmac, which is fully compliant with the open standard IEC 61131-3, accompanied by proprietary software developed entirely by Omron (Sysmac Studio), guarantees almost total integration of all the components (NJ, temperature controllers, motors, positioners), even at programming level. In terms of troubleshooting this is a substantial advantage, because all problem-solving functions (for errors relating to both the controller and to EtherCAT-connected devices) are already preset on the NS panel. This means that, in the event of an anomaly, the operator panel is able to display the type of alarm and the countermeasures to be taken. This type of architecture has been devised to improve operational flexibility, especially with a view to the migration to electronic cams. The Omron platform enables the easy importing of geometry parameters linked to the original profiles, so as to allow the continuous monitoring of motor function activities.
Furthermore, simulation functions allow programming to be carried out irrespective of mechanics; it is even possible to simulate the activity of a third-party motor (with an accuracy rate of 95-96%) in order to understand what the corresponding cycle is and whether it can be respected. Consequently, this allows the possible integration of third-party products:
"End users don't want a black box; they want open machines which can be adapted to existing technologies and to technologies defined in specifications," said Carlo Innocenti. "Omron has understood this for some time and the use of an open network with shared programming protocol further confirms that."