Enhanced performance and reduced costs in bottle cap lining and post-molding automation equipment

Food and beverage quality hinges on the reliability of sealing technology used in packaging, necessitating very high quality requirements in this area. In order to prevent the entry of oxygen and a change in the taste or shelf life of the product through oxidation, the caps of beverage bottles, for example, employ a liner. This provides additional protection for the hermetic seal between the cap and the container opening. One of the leading specialists in this market segment is Canadian company, MMC Packaging, based in Laval, Quebec. For two decades, the packaging innovator has supplied turnkey systems for the lining of plastic and metal caps. Major customers for MMC include suppliers to the food and beverage, pharmaceutical, and personal care/beauty products industries.

Safe and hygienic packaging for consumer products

The cap lining machines from MMC Packaging cut the lining material (pulp, foam, cardboard or foil) and insert it into the cap. Depending on the machine configuration, cutting may take place as rotary die cutting; i.e. rolls of liners are pre-cut and subsequently fed to the insertion station. With punch and die technology, the liners are cut and inserted into the cap in a single operation. Subsequently, a vision system inspects the caps to ensure they are free of defects before they are sorted or moved to the next production step.

MMC Packaging has designed various lining machine versions to suit different cap sizes and types: up to 1,200 caps can be processed per minute, depending on the type of machine and the operating mode. MMC’s best-selling machine, the LM-270, performs 150 cycles per minute, according to MMC Packaging’s President and owner, Philippe McNally. The cutting and insertion of the liner can be done both for one and two caps at a time, so that up to 300 parts can be processed per minute. The settings of every component in the line are managed automatically, so changing a recipe or production parameters can be done at the press of a button and production changeovers take less than 30 minutes. Some machine models from MMC can also run several tooling types, eliminating the downtime associated with production changeover.

PC-based control increases efficiency

The control hardware previously used by MMC Packaging had reached its technological limits: “The processing speed, system memory, data storage and database capabilities would not allow any further optimization of our machine,” explains Mathieu Ouellet, Vice President of Business and Product Development, MMC Packaging. “We needed more processing power on the one hand, and greater flexibility of the control platform on the other. In addition, we wanted a state-of-the-art user interface with a wide variety of standard programming tools.”

The complete automation of the LM-270, including the feeding, cutting and mounting of the liner, inspection/rejection, and the confirmation of rejects, runs on a PC-based control system from Beckhoff. A C6525 Industrial PC (IPC) with Intel® Celeron® dual-core processor and TwinCAT 3 automation software provides the foundation for the control system. “With TwinCAT 3, manual intervention is minimized when performing timing changes on the machine,” stresses Yan Letourneau, Senior Electrical Designer, MMC Packaging. Using automatic timing in software, the LM-270 machine, with all its connected peripherals, can change speed on the fly and adapt the production rate of the machine to the client’s needs to maintain high throughput, among other concerns. TwinCAT 3 NC PTP controls and synchronizes the indexing, cutting, and insertion of the lining material with registration marks. “TwinCAT 3 Scope
MMC Packaging supplies modern, turnkey lining machines for the post-molding of metal or plastic caps in the food, pharmaceutical and personal care/beauty products industries.
records all the data in the process,” Yan Letourneau continues. “The PC is not only a central controller, but also a production data recorder.”

Modernized machine operation with multi-touch
The LM-270 lining machine uses a multi-touch Control Panel from the Beckhoff CP391x series as its HMI hardware. “With the PC and EtherCAT-based control platform, we created a state-of-the-art user interface that provides the client with important production data in real-time,” comments Yan Letourneau. “This also includes comprehensive operational and performance data from the machine. MMC clients have up-to-the-second information regarding the health and efficiency of equipment, optimizing maintenance efforts and boosting machine uptime.” MMC Packaging utilizes 3D models and tutorial videos for operator training and support regarding the handling of the new control platform. “The ability to run the Windows-based graphical interface, as well as PLC and motion control tasks, on a single device was, in our view, a huge factor in favor of PC-based control,” stresses Mathieu Ouellet. “Our 3D manual uses multi-touch functionality, programmed using C++ and C with pinch gestures for zooming in and out, allowing customers to view valuable equipment information, for example.”

Tried and tested in the LM-270 cap lining machine, the PC-based control platform is now also employed by MMC Packaging in its QTVision™ inspection system, which checks the quality of the caps. In this case, a CX2040 Embedded PC, with TwinCAT 3 automation software and EtherCAT as the system bus, simultaneously runs several automation, control, and data acquisition tasks. “With four cameras, we can now inspect up to 2,400 caps per minute and process up to 9,600 images per minute without causing strain on the CPU,” Yan Letourneau confirms.

EtherCAT as the universal system bus for I/O, motion and safety
“Thanks to EtherCAT, control speeds in the low microsecond range are now commonplace for MMC Packaging, such as triggering cameras in the vision system at 250 microseconds,” notes Yan Letourneau. “The integrated TwinSAFE safety solution from Beckhoff represents further added value. We use standard Ethernet cables for safety technology as all the safety data now goes through the EtherCAT protocol and there are TwinSAFE terminals in use throughout the machine. A system-integrated programmable safety solution is much easier to modify in the future as our machine designs evolve.” MMC Packaging primarily uses TwinSAFE for emergency stops, safety devices, and for safety measures on drives. The TwinSAFE drive option cards are used on the Beckhoff AX5000 Servo Drives to implement safe stop functions (STO, S5).

Machine footprint reduced, performance increased
MMC Packaging uses servomotors from the AM8000 series which feature One Cable Technology (OCT). “The One Cable Technology, along with high-density
EtherCAT I/Os and integrated TwinSAFE safety solution are perfect for the streamlined machine design that was our goal,” says Mathieu Ouellet. “Instead of managing all control wires from the central units to all of our peripherals, we now only have to wire a single Ethernet cable, which dramatically cuts our wiring cost and saves approximately 20 to 24 hours of installation time per setup. A further advantage is that EtherCAT allows the integration of any standard Ethernet device. MMC also uses the EtherCAT gateway terminals as an interface to other networks and protocols when required.”

“The first stage of the controller upgrade has now been successfully completed,” states Anthi Balafoutis, Sales and Marketing Coordinator, MMC Packaging. “So far we have converted the LM-270 machines, our MMC-icon™ user interface, and our QTVision™ inspection system to the PC-based control platform. The next step will be to implement this technology in our entire range of machines.”

Further information:
www.mmcpackaging.com
www.beckhoff.ca

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