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Packaging Intelligence Brief

AUTOMATION TRENDS

Robotics: speeding products to market through changeover acceleration, efficiency improvement and cost reduction

About the Packaging Intelligence Brief Series

Packaging plays a critical role in our global economy and touches the lives of everyone. For more than 70 years, the Packaging Machinery Manufacturers Institute (PMMI) has been the leading global resource for packaging manufacturers to learn about industry trends, obtain training and get involved in networking events.

PMMI is proud to introduce the Packaging Intelligence Brief series which focuses on trends that are shaping the future of the industry. Over the next year, PMMI will regularly release Packaging Intelligence Briefs to address various topics that are significantly impacting packaging and outlining how suppliers and manufacturers are responding to market needs.



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Robotics: speeding products to market through changeover acceleration, efficiency improvement and cost reduction

With demand growing for unique ways to differentiate products and engage consumers to generate sales, new product introductions have skyrocketed, and pack patterns and sizes continually evolve to meet retailer and consumer requirements. Delivering these variations in a timely manner requires flexibility and quick changeover that can often only be accomplished with automated equipment.

As a result, packagers are deploying more robotic systems, performing more tasks via software and demanding more tightly integrated machines, while keeping a firm rein on costs. According to recent statistics from the Robotic Industry Association (RIA), sales of packaging and palletizing robots rose by approximately 113 percent between 2000 and 2005, with a 15 percent increase in sales between 2004 and 2005 alone¹.

Equipment builders have responded by delivering more turnkey systems, creating more modular designs, replacing pneumatics with electromechanical devices and automating inspection tasks to accelerate changeover, increase speed, boost efficiency, simplify integration, lower costs and ensure consistent product quality.

ROBOTIC PALLETIZING SECTOR GROWTH

The inherent flexibility of robots greatly facilitates changeover from one size or type of product to another. As a result, material handling is one of the fastest growing segments of the robotics market, showing a 67

percent gain in the first quarter of 2005 over the same period in 2004². Able to handle everything from caps to pouches to torque converters, robotic palletizing is quickly growing in popularity.

This popularity extends beyond multinational companies to smaller packagers. In fact, robots are seeing increased use among companies with 100-200 employees. With their smaller footprint and superior precision over conventional palletizing technology, robots offer major advantages for smaller packagers with lower-speed lines.

To help Guida's Milk & Ice Cream (New Britain, CT) automate palletizing on two lines, Dyco, Inc. (Bloomsburg, PA) developed a system featuring a KUKA KR 180 PA robot that runs 12 to 16 hours per day, six days per week. On one side, it picks up corrugated cases containing eight half-gallon or four gallon jugs and stacks them on a pallet. Gallon cases are picked up four at a time and placed in a row on the pallet. Each layer has three rows, and pallets are stacked four high for a total of 48 cases. The half-gallon cases also are stacked four high, but are handled five at a time and arranged in four rows per layer for a total of 60 cases per pallet.

On the other side of the work cell, 12-count trays of 10- or 16-ounce bottles arrive on a second line and are picked up four at a time and arranged in layers of 20 cases. The 10-ounce bottles are stacked nine layers high; the 16-ounce bottles go six high. Since the trays of

¹ Steve Sterling, "What's not to like about robots?," *Packaging World* August 2006: 46

² George Weimer, "Robots Moving into Packaging Plants," *Paperboard Packaging* 1 August 2005: www.packaging-online/paperboardpackaging/content/printContentPopup.jsp?id=176804

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the smaller containers arrive more frequently, the robot is programmed to alternate between the two lines and builds two pallets at a time. The robot can insert slip sheets between layers to enhance the stability of the final load and build partial pallets for specific orders. A pallet handling conveyor delivers empty pallets to the robot and transfers full loads to an adjacent stretch wrapping cell. Installation of the robot cell made it possible for the dairy to reassign two workers to less physically demanding work.

FACTORS INFLUENCING INCREASED ROBOTIC USAGE

Ergonomics and flexibility were the influencing factors behind FKI Logistex's design of a robotic palletizing cell for JTM Products Inc. (Solon, OH), a maker of tire mounting/demounting and pipe joint lubricants. This palletizing cell, anchored by an articulated robot from Motoman Inc. (West Carrollton, OH), also handles two packaging lines. A vacuum end effector from FKI Logistex allows the robot to handle 25- and 40-pound pails as well as quart or gallon containers in cases, plus a variety of stacking patterns and pallet sizes. The robot, which is only working at 65% capacity at present, has provided a 55% productivity gain compared to hand stacking, freeing the crew to complete other activities.

Robots can also handle multiple products in a compact space, driving increased usage of robotic case packers and palletizers, for example. These machines range in complexity, handling up to 50 product variations simultaneously.

Order picking and assembly of mixed pallets is also generating significant interest. New ROBOGUIDE-PalletPRO and PalletTool software from FANUC Robotics America (Rochester Hills, MI) can automate the building of mixed pallets. Generally, this requires a robot mounted on a linear slide so it can cover the distance across multiple packaging lines. Automating mixed pallet building may also require integration with vision and tactile sensors and sophisticated communication technology.

ADDITIONAL FACTORS: SPEED AND SOFTWARE

Higher speeds and modular software are also influencing the growing interest in robots. Faster speeds are possible through mechanical design improvements and robot controllers with better motion architecture. FANUC, for example, has more than doubled the wrist rotation speed of its M420iA robot from 350 degrees per second to 720 degrees per second and the M-6iB/2HS from 1200 degrees per second to 2000 degrees per second. Adding vision systems supports higher rates by making it possible for the robot to pick up multiple items at a time.

On the software side, ELAU Inc. (Schaumburg, IL) has developed a software object library for robots. The array of IEC 61131-3-conforming Function Blocks contain all the complex kinematics algorithms needed for Cartesian, articulated, SCARA, portal and gantry robots to perform the most popular packaging functions including pick-and-place, carton and case packing and end-of-line tasks. The blocks

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of code eliminate black box proprietary robot controllers and simplify integration of robotic action into packaging machines. Since over 80% of the Function Blocks programming is predone, this technology is estimated to save over 50% of engineering time compared to traditional programming.

More robust software can also enhance machine safety and productivity. Omron Electronics' (Schaumburg, IL) Secure-One DeviceNet Safety Controller, for example, uses standard DeviceNet network wiring and pre-programmed safety Function Blocks to eliminate separate cabling and communication. Monitoring safety through DeviceNet makes it possible to identify faults in an instant and simplifies installation and modification.

Machine efficiency can also be monitored. Machine Performance Solutions from Rockwell Automation (Milwaukee, WI) let operators generate basic reports from the operator interface, saving significant time and effort associated with manual data capture and report generation.

INTEGRATION THROUGH TURNKEY SYSTEMS

With many packagers possessing limited engineering resources, demand for turnkey systems is rising. According to PMMI's 2006 "U.S. Packaging Machinery Purchasing Plans Study," over 37 percent of the 446 surveyed packaging decision-makers use systems integrators. This is nearly a five percent gain over comparable figures in 2003.

There is also a growing trend toward integrated controllers that perform more than one function. Rockwell offers integrated robot and automation control that combines servos and input/output handling on one hardware and software platform. This eliminates the need to create communications between two controllers, simplifying programming and maintenance.

Helping expedite integration is the evolution of standards such as PackML developed by the Packaging Working Group of the OMAC Users Group (Research Triangle Park, NC) and ISA S88 from the Instrumentation, Systems, and Automation Society (Research Triangle Park, NC). International standards assure a level of commonality that packagers need to keep total cost of ownership low, while stimulating the healthy competition that internal standards stifle.

ENHANCED COST-EFFECTIVENESS

Concerned about shrinking margins, reduced productivity and overseas competition, packagers are looking for ways to automate, increase throughput and reduce costs, demanding machinery that can be tailored to meet specific functionality requirements.

This demand has resulted in a considerable cost reduction for robotics. Carl Traynor, Marketing Director of Motoman points to recent research indicating that robots in 2005 cost about 10 times less than their counterparts 10 years earlier³. Continuing this trend, FKI Logistex has developed a lower cost, low-level

³Weimer, George. "Robots Moving into Packaging Plants." Paperboard Packaging, 1 Aug 2005: www.packaging-online/paperboardpackaging/content/printContentPopup.jsp?id=176804

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palletizer capable of handling up to 20 cases per minute. Priced at \$70,000 with automatic pallet handling and \$50,000 without, this new series of machines will cost significantly less than other palletizers of this type, which typically start at about \$100,000. Designed from the ground up for efficient manufacture and assembly, the palletizer can be changed over in less than 10 minutes without tools.

Packagers are also lowering costs by dropping requirements for specific controls and allowing OEM's to match the control to performance requirements. For example, Bosch Rexroth Corp., Electric Drives & Controls Division (Hoffman Estates, IL) has developed a three-tier control architecture capable of handling up to eight, 16 or 64 axes of motion, respectively: the low-cost IndraMotion MLD digital drive with resident motion and logic control; the IndraMotion MLC programmable logic controller that handles both motion and logic; and the PPC, which is based on Power-PC technology and integrates motion and logic control in a rack-based system or PCI card that can be installed in a personal computer. These technologies enhance efficiencies by allowing automation platforms to be scaled to meet the needs of the machines rather than forcing the machines to fit the control platform.

INTEGRATING MOTORS AND DRIVES

Integrated motors and drives are another cost savings measure. Miniaturizing servo drives and placing them on top of servo motors reduces the size of the electrical cabinet needed, shrinks the machine footprint and

reduces the amount of wiring required. This is especially significant in applications where cabinets must be located in catwalks and require lengthy amounts of cabling. This can quickly add up to a 40 percent reduction in machinery price.

ELAU's Virtually Zero Cabinet Initiative also relies on integrated motor/drive technology. The company's PacDrive SCL-055 integral servo motor/drive technology for high-speed rotary fillers, cappers and labelers reportedly overcomes heat generation problems that have hampered previous attempts to integrate drive electronics with motors. The integral servo motor and drive eliminate an entire category of cabling with all its potential failure points, reducing cabinet size and wiring.

For applications that use separate motors and drives, ELAU offers plug-and-play functionality. A chip in the PacDrive SH motors allows the company's PacDrive family of intelligent servo drives to identify it so that the drive can adjust automatically if the motor is changed. This simplifies setup and can reduce spare parts inventory by as much as 60 percent.

Bosch Rexroth has gone a step further and embedded safety technology into its drives. Locating safety functionality at the drive level means response to faults occurs in milliseconds rather than the seconds it requires for a message to travel to the controller. The Safety on Board functionality makes provides Category 3 level safety without padlocking during maintenance, reducing downtime and increasing productivity.

About PMMI

The Packaging Machinery Manufacturers Institute (PMMI) is a trade association whose more than 500 members manufacture packaging and packaging-related converting machinery in the United States and Canada. The association also has more than 20 supplier members who manufacture commercially available packaging machinery components. PMMI's vision is to be the leading global resource for packaging. Its mission is to improve and promote members' abilities to meet the needs of their customers.

PMMI also produces three tradeshow: PACK EXPO International, PACK EXPO Las Vegas and EXPO PACK México.

Visit www.pmmi.org for more information.

About PACK EXPO

With more than 1,900 exhibitors showcasing a diverse range of advanced, high performance packaging materials and equipment, PACK EXPO International 2006 will be the year's largest, most comprehensive resource for packaging strategies that build brands. Being held October 29 – November 2, 2006 at Chicago's McCormick Place, PACK EXPO will be co-located with PROCESS EXPO and the Converting & Package Printing EXPO (CPP EXPO).

PACK EXPO Las Vegas will be held October 15-17, 2007 at the Las Vegas Convention Center in Las Vegas, NV.

EXPO PACK México, the premier packaging show in Mexico serving the Latin American region, will be held June 26-29, 2007 at Centro Banamex, Mexico City, Mexico.

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