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Integrated PPC Makes Servo Gantry Palletizers Affordable Option For Smaller Firms

These servo gantry palletizers employ a combination of PPC-control and motion-control software for ease of programming.

Smaller companies have often shied away from automated systems for palletizing or de-palletizing in a packaging line due to the high costs associated with robotic equipment and on-staff specialists. But

Automated Motion, Inc. (AMI, www.automated-motion.com) has developed a reliable and easy-to-operate, gantry style robot that uses a combined motion-and-logic control package to help make automated pallet-building an affordable option for smaller companies, or even large users running many SKUs at slower rates.

The company's GP Series of servo gantry palletizers relies on a combination of PPC control and Visual-Motion software from Bosch Rexroth (www.boschrexroth-us.com) to simplify machine control and programming. Operators and maintenance staff require minimal training to run, maintain and troubleshoot the equipment effectively, bringing automated palletizing capability within reach of even smaller companies with limited budgets.

The firm has designed and built both gantry-style and six-axis, articulated arm robots. The GP Series was designed to satisfy a niche of manufacturers that

want versatile robotic palletizing without the need for specialized robotic programmers on staff. According to AMI sales manager Jeff Ayotte, "The advantage with using gantries is that they require a lower level of operational training than what is needed to run a full, six-axis robot."

Using Bosch Rexroth components, AMI's GP Series servo gantries efficiently palletize, de-palletize and handle cases, cans, bags, boxes, or other packages with minimum setup time. The gantry's five axes of motion include left and right motion, forward and backward motion, up and down motion, 360-deg. rotation and 90-deg. tilt capability.

"Typically, a gantry can handle heavier payloads than an articulated arm," says Ayotte. "Both styles can usually perform 12 picks per minute or more. For a larger number of SKUs at slower volumes (1 to 2 cases per minute), a gantry's advantage is that it can cover more pallet positions with one system," he says. "It's not a matter of one technology being superior; it's a matter of the requirements of the application. With robotics you can palletize as many as the reach allows. A gantry can be designed to span a much larger area, thus covering more lines and pallet stations than an articulated arm. The limit really depends on the customer," says Ayotte.

Ayotte says that AMI's GP Series of gantries do not require specialized training to operate, so a standard model may represent only two-thirds the cost of other robots. "This means that smaller shops can now consider cost-effective automation," he explains. "With drop down recipe menus,



The standard GP1 palletizer features a 3-axis servo system from Bosch Rexroth, belt-driven actuators with 1 mm-per-meter accuracy, load capacities to 70 lbs., a 90-deg. rotating head and simplified pattern creation from the operator interface.

a touchscreen operator interface and error diagnostic screens, the front-end control really makes it easier for the operator to learn. Larger companies also like the Bosch Rexroth PPC controller because it provides open communication, allowing information-sharing using industry standard protocols. This saves time and improves performance across the entire line," he adds.

The teach function on the Bosch Rexroth PPC utilizes icon-based programming with standard ladder logic, which makes it easy to use in any end-of-line application. "It is especially suited to operations that want to replace hand palletizing but can't or don't need to make the full leap to articulated arm robotics," said Ayotte. "It can also serve larger operations that want a cost-effective, work-horse machine for palletizing as many as 12 different products in one system."

The GP Series palletizers range from the GP1 to the GP12, where the 1 and the 12 represent the number of different stations within the gantry. Supplied with 3, 4, or 5 axes, the series provides a small footprint with working envelopes up to 20-by-80 feet, and many optional accessories. The standard GP1 features include a three-axis servo system, belt-driven actuators with 1 mm-per-meter accuracy, load capacities to 70 lbs., a 90-deg. rotating head, and simplified pattern creation from the operator interface. Options include up to 12 pallet stations, full pallet discharge conveyors, light curtain access/egress, 360-deg. servo rotating head, a multiple case or layer pick gripper and load capacity to 1500 lbs.

The GP1 gantry, for example, is a single position gantry typically used as a pallet build or de-palletizing station. Applications requiring a second pallet build, or slip-sheet stack, are ideal for the GP2 gantry. The GP Series gantries can handle up to 12 different stations, orient cases on a pallet, and with a five-axis model, flip product on its side while keeping labels facing out. A second pallet position can be used for slip sheets or top caps, just to name a few of the available options that can be incorporated into the layout. The GP Heavy Duty

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AMI's GP Series of gantry palletizers can be configured to palletize an entire layer with vacuum cups or a Unigripper™.

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model can cover a large working envelope and can handle 1500 lbs. The GP Series palletizers can also be configured to accumulate and palletize an entire layer with vacuum cups or a Unigripper™.

Maintaining Control

The Bosch Rexroth PPC-R controller, from the company's Electric Drives and Controls technology group, is a key part of the GP Series control package. Its platform works as a PLC and as a motion controller, depending on the application and software. Complex automation tasks can be solved by grouping multiple PPC controls and masters. The PPC manages up to two cascading masters and a maximum of 40 slave axes in a SERCOS ring. As many as 32 PPCs can be connected to each other using the cross-communication interface, which allows the assignment of the master positions to the slave axes in various SERCOS rings. The



Spearheading the control package are the Bosch Rexroth PPC-R, a powerful controller in a small size, and the EcoDrive Cs drives which provide industry-standard interfaces including SERCOS, DeviceNet, CANopen or PROFIBUS-DP.

Projecting The Future of End-Effectors

By Beth van Haaren, Design Engineer, The Robotic Accessories Leader (RAC)

Robots and robotic end-effectors have been in ever-increasing demand for more than 20 years. In response to the ongoing development of a world economy, industries in the United States and overseas have put a growing number of robots into service in an effort to remain competitive. As the demand for robots spreads to new industries and manufacturing environments, end-effector manufacturers are challenged to create the products needed to optimize their customers' robotic investments.

As robotic technology moves beyond traditional functions of performing simple or repetitive tasks, robots must execute increasingly more complex actions, performing more like human beings. From the manufacture of furniture, previously performed by a craftsman, to food handling and meat processing, previously handled by a butcher, robots are being expected to do more and more. With such expectations, end-of-arm tooling must progress to address the

challenges these environments represent. Future end-effectors need to be designed to meet the food processing standards of the United States Food and Drug Administration (FDA), be able to effectively grasp and manipulate flexible (and form-changing) products such as raw meat, and be able to retain its functionality in spite of adverse environmental conditions.

In many developing robotic markets, robots are not only being expected to perform with the skills and capabilities of a human but are being required to interact with humans. For example, medical professionals are now exploring the use of robots to manipulate the orientation of the patient to make the administration of chemotherapy more precise, and to help capture dynamic medical imaging of skeletal motion to help those affected by joint, spine, or neurological diseases. The capability to interact with and, even more importantly, to react to the inherent unpredictability of humans will provide challenges for both robot and

end-of-arm tooling manufacturers for many years to come. End-effector manufacturers are even now being asked to create products that can "sense" the environment and transmit that information accurately and quickly to the robot controls. Grippers with sensors simulating the human hand and the use of collision sensors to sense and react to unexpected contact represent just the tip of the new expectations.

What is the future for end-of-arm tooling? The answer lies with "smart" end-effectors designed to mimic the capabilities of human touch. Future end-effectors, through tactile sensing, will be able to adjust orientation, stroke, speed, and/or grip force in reaction to their changing environment.

Beth van Haaren is a design engineer for The Robotic Accessories Leader (www.rad-ra.com).

number of synchronized drives is almost unlimited, so separating the machines into independent sections becomes possible.

Peter Caldwell, sales engineer at Bosch Rexroth, helped Ayotte design the control system. Ayotte notes “we selected the PPC because it represents the latest generation of technology for combining motion control and PLC logic in one package.” He adds that, “an operator can run the entire machine with one package of software and we don’t need a separate PLC and motion controller.”

Complementing the PPC is Bosch Rexroth’s EcoDrive Cs, a compact, low-power (100 to 750 W) servo drive. The drive works on single-phase and three-phase supply systems with input voltages up to 230 V. Among the most compact servo drives available, most units are just 55-mm wide, 182-mm high, and 170-mm deep. The EcoDrive Cs provides industry-standard interfaces including SERCOS, DeviceNet, CANopen, or PROFIBUS-DP interfaces. It is ideally suited for use in systems with interconnected, multi-axis configurations, or as intelligent single-axis drives on a standardized fieldbus. The EcoDrive Cs firmware is based on proven, process-oriented technologies, including electronic gearing, cam tables, and fast registration inputs, making it an appropriate choice for handling systems. User programming is simplified with intuitive, Windows-based commissioning software called DriveTop. The 16 Mbit/s SERCOS interface also allows trouble-free communication with Bosch Rexroth’s motion control solutions, like the PPC-R, as well as third-party control systems.

According to Caldwell, the control system gives the gantry predefined kinematic functions. “The control system has already translated the real world applications into axes of linear motion, so all the user must do is enable the functions,” he notes. “The time savings in programming, aided by icons and flow charts, is a definite

advantage compared to other text-based products which require a greater level of operator training.”

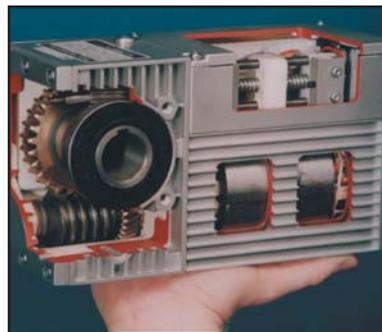
For its operator interface, the GP Series uses the Bosch Rexroth VCP25 Operator Terminal, which provides customized palletizing recipes in drop down menus. This allows the operator to change products easily from shift to shift, week to week or as often as required. The control system also includes error diagnostics that tell the operator when there is a problem, such as an obscured pallet or jammed product. The standard control system can manage up to 30 pallet patterns.

Bosch Rexroth MSM permanent magnet motors complete the cost-effective automation system. The motors are characterized by high operational reliability and maintenance free operation, even under adverse conditions. These benefits are attributable to the motor’s brushless design and grease-lubricated bearings, as well as its completely closed motor design with IP-65 protection.

To date, AMI has sold over 30 of the new GP Series palletizers to a variety of end users and industries, including Abbott Labs (makers of Pedialyte), Pfizer Pharmaceuticals (consumer goods), Goetze’s Candy Company, Independent Can, Hedwin Group (industrial containers), Federal Mogul (brake shoes), and World Kitchen (glassware). RW

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