

New Gantry Hybrid Palletizer from PAI Provides Flexible, High-speed, Gentle Case Handling for Bottlers

Integrated Motion on EtherNet/IP™ Simplifies Machine Design, Control and Integration with Singular Programming Environment

Solutions

Integrated Architecture™ System

- Allen-Bradley ControlLogix programmable automation controller integrates high-speed discrete and motion capabilities
- Seamless, real-time communications over the EtherNet/IP network
- Allen-Bradley Stratix 6000 managed Ethernet switches direct network traffic
- Allen-Bradley MP-Series servo motor
- Allen-Bradley Kinetix 6500 multi-axis servo drives

PartnerNetwork™

- Kendall Electric Inc., local Rockwell Automation distributor, assisted PAI with system design and delivery

Results

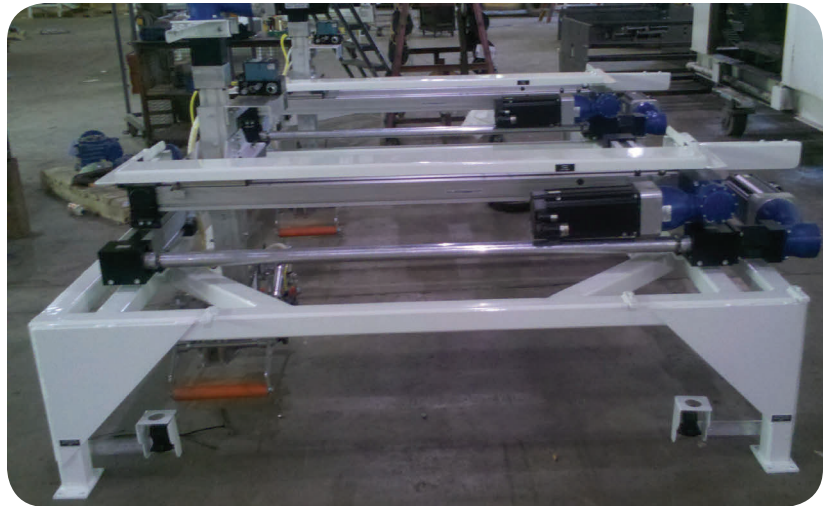
Eased Maintenance and Changeovers

- Integrated Motion on EtherNet/IP allows RSLogix 5000 design and configuration software to function as the machines' sole programming environment
- Reduced the time required to incorporate a new pattern or to troubleshoot motion or logic issues

Lower Total Cost to Design, Develop and DeliverSM

- Reduced machine design and development time to just three months, a reduction of more than half
- Delivered lower-cost machine for end user by cutting development costs

Authorized Distributor Partner



The Gantry Hybrid Palletizer incorporates a dual-head gantry crane that stands above a conveyor belt carrying a steady stream of bottle packs.

Background

That 28-pack of bottled water you picked up at the store is more than a modern convenience. It's an engineering success story.

First, the plastic bottles themselves are much thinner than the ones you drank from as a kid. In fact, they could be thinner than those you purchased last year. Technological advances have allowed the beverage industry to trim the plastic used in bottles, reducing material and production costs.

Also, a 28-pack? Until the last decade, shoppers' choices were limited to six-, 12- or 24-packs. Today, beverage producers make a wide range of pack sizes to serve an equally wide range of retail outlets and consumers.

Meeting these market demands has posed challenges for the machine and equipment builders that create the packaging technology that assemble the bottles into cases and prepare them for shipment. Production Automation Inc. (PAI) – a machine builder in Montgomery, Ala., that specializes in palletizers – relied on ingenuity and innovation to engineer a machine that's flexible enough to accommodate varying pack configurations and sizes, and gentle enough to avoid damaging today's thin plastic bottles.

LISTEN.
THINK.
SOLVE.

Challenge

PAI has extensive experience in building palletizers, but previous designs weren't suited to the changing demands of bottling clients. Traditional palletizers use physical diverters to sort products into specific patterns for packaging. Each new pack size or configuration requires a new pattern, meaning diverters must be added, removed or rearranged. This conversion typically requires about three days of downtime, including testing time. On top of the lost production is the cost of new diverters, turning devices or other components, which can run into tens of thousands of dollars. Servicing and install labor charges can add thousands of dollars more.

Another quandary: Diverter-based palletizers can have trouble sorting and packing thinner bottles at high speeds without product damage and loss. Imagine turning up the speed on a traditional machine, sending thin-skinned bottles careening into a diverter. Dents, popped-tops and product spills can result, all equating to financial losses for the bottler.

Robotic-arm palletizers have been developed as an alternative to diverters. Robotic machines can run fast with a soft touch, but are often expensive to run and maintain. The typical bottling facility doesn't generally stock spare parts for robotic arms. Many robotic arms also require separate control platforms and even separate communication networks to carry out high-speed, precision motion. Operators and maintenance personnel are also less familiar with these components and software, so maintenance and repair work regularly requires third-party support.

Solutions

PAI worked with Kendall Electric to develop a palletizing solution that is fast, flexible, tender with the product and easy for staff to use with their existing infrastructure and knowledge base.

The result: the Gantry Hybrid Palletizer – a machine that utilizes integrated motion on EtherNet/IP to provide the flexibility and ease-of-use PAI's customers wanted, without sacrificing speed or handling quality.

The Gantry Hybrid Palletizer incorporates a dual-head gantry crane that stands above a conveyor belt carrying a steady stream of bottle packs. A robotic arm extends from each crane and moves laterally, gently reaching down to grab a case and position it into a predetermined pattern for palletizing. Guards are raised at various points along the conveyor to hold cases in place, allowing additional cases to flow into the machine and line up in pattern. At the end of the conveyor, the arranged cases are lowered onto a pallet in layers for shipment, based on order requests.

The robotic arm's precise and soft touch allows it to grab cases packaged in any material, including shrink wrap or cardboard trays. Cases can flow into the machine at

variable rates, depending on the speed needed that day. Both cranes can operate at the same time or one can serve as back up. In dual mode, the machine can arrange more than 80 plus cases per minute.

PAI chose to network the entire machine on EtherNet/IP – the only established industrial protocol designed to connect from the instrumentation level all the way up to the end customer's IT infrastructure and across applications, including discrete, process, safety, motion and drive control. The network has been popular with PAI customers for many years in control and visualization applications because it can handle large amounts of data at high speeds.

With integrated motion on EtherNet/IP, the new machine has a single, open network architecture and just one software design environment for programming. Movement instructions for the precision palletizer's robotic arm travel over the EtherNet/IP network from an Allen-Bradley® ControlLogix® programmable automation controller (PAC) from Rockwell Automation.

In the past, motion applications required their own dedicated networks. But the use of the EtherNet/IP network for all machine communications – including motion control – reduces cabling required, proprietary hardware and software, and the need to create gateways to get information to or from secluded networks. When Kendall Electric introduced PAI to EtherNet/IP-enabled precision motion control products from Rockwell Automation, PAI design team realized they could efficiently integrate motion into their control platform for the Gantry Hybrid Palletizer.

Unlike other Ethernet-based solutions, EtherNet/IP relies on standard infrastructure components and can be integrated into a plantwide Ethernet network without gateways or routers. PAI design team used EtherNet/IP-ready Allen-Bradley Kinetix® 6500 servo drives to control Allen-Bradley MP-Series™ low-inertia motors. Allen-Bradley Stratix 6000™ managed switches direct network traffic and reduce the amount of data on the network. Motors and servo drives are configured using the same Rockwell Software® RSLogix™ 5000 design and configuration software used for PAC programming.

"Avoiding third-party software integration and additional communication networks is a big deal for our customers," said Terry Davis, chief executive officer at PAI. "Our customers' engineers are already familiar with Allen-Bradley hardware and the RSLogix programming environment, so using common hardware and a single network and design platform makes a gantry system a lot easier and cheaper to deploy and maintain."

EtherNet/IP uses time synchronization to get the performance and precision that motion control demands. Time reference is distributed across nodes so the network does not have to be scheduled. Network traffic is dramatically reduced because the size and content of data packages can be dynamically changed.

“Our customers can connect the machine through one single channel, to other machines, to the entire line and even up into the business level,” Davis explained. “So we didn’t need to consider separate network requirements and specifications when designing the motion application. Plus, for my company, replacing a multi-tier networking strategy with one standard network architecture reduced engineering, commissioning and deployment time, and integration risks.”

Results

PAI reduced design time by using the Allen-Bradley Drives and Motion Accelerator Toolkit with Motion Analyzer design software. “We were able to bring the machine to market quickly at reduced development costs,” Davis said.

The toolkit helped PAI select components, develop CAD drawings, write code, lay out HMI screens, and start up and troubleshoot machines. Using the software, PAI simulated the palletizer in a digital environment first, and worked out any kinks or issues before they began working on the live machine. These tools helped PAI design and produce a working physical model of the Gantry Hybrid Palletizer in just three months – less than half the usual development time.

“We added details for our machine – the control system we were using, the speed we needed, etc. – into the toolkit and had a complete bill of materials within minutes,” said Kevin Davis, Electrical Design Controls Manager. “The program also provided electrical drawings that we handed straight to the electricians charged with wiring the Gantry Hybrid Palletizer.”

Base logic-code was generated for PAI’s engineers, so they only ended up writing about 60 lines of code for the whole machine. And no time was required to develop touch-screen faceplates.

“We also used preconfigured HMI plates from the toolkit,” Davis said. “And, Motion Analyzer showed us we could use smaller motors and drives than originally planned, which helped us cut component and energy costs for our end users.”

Leveraging these free design tools and choosing integrated motion on EtherNet/IP allowed PAI to create an affordable, precision, fast robotic case-handling solution for its customers.

“We avoided the pitfalls of other robotic solutions,” Davis said. “Our new Gantry System lets our customers modify the pattern of a pallet stack without massive mechanical or software changes, reducing downtime. This also makes the machine easier to maintain. It’s a better solution at an affordable price.”

The results mentioned above are specific to PAI’s use of Rockwell Automation products and services in conjunction with other products. Specific results may vary for other customers.



Rockwell Automation and PartnerNetwork companies collaborate to help you develop an ongoing approach to plant-wide optimization, improve your machine performance and achieve your sustainability objectives.

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