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02. December 2024

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A New Automated Handling System Dramatically Improves the Volume of EV Battery Cells Through Quality Inspection

Harris Hill Automation offers valuable insights into its first-time use of Festo products and productivity tools.

Safe, thorough, and fast inspection of charged electric vehicle (EV) battery cells is essential for lowering production cost and ensuring the quality of EV batteries. Harris Hill Automation, Poland, Maine, USA, a young, nimble, and customer-focused machine builder, recently designed and built a handling system to feed battery cells into and out of their OEM customer's proprietary quality inspection system. The Harris Hill Automation solution handles and tracks and traces batteries, while increasing production throughput twentyfold.

[Festo engineering tools](#) and product solutions were new to [Harris Hill Automation](#) at the outset of this project. Talking with company President Bill Gagne presented the opportunity to consider Festo solutions from an interesting perspective – that of an expert control engineer and businessperson who was engaging with Festo and its solutions for the first time.

Origin of the engagement

“I received a sales lead from the [Festo E-Mobility](#) sales team after they attended the 2023 North American Battery Show,” said Festo sales engineer Paul Hubbard. “The sales lead came from an OEM that offers a proprietary solution for 100% inspection of charged battery cells. The OEM had no automated process to feed the cells into and out of their inspection system at the high rate required by their end-user customers. I needed to find a custom machine builder who could develop a handling system on a tight schedule and be willing to commit to applying Festo products to that system.”

While Hubbard called on numerous machine builders in his area, there was one company he thought would be perfect for the project due to their expertise, capabilities, and adaptability, even though they were not yet a Festo customer. Adaptability was the key factor that made Hubbard decide to approach Harris Hill Automation.

“Four-year-old Harris Hill Automation offers comprehensive industrial automation solutions, specializing in custom turnkey equipment, as well as service and upgrades across a wide range of markets,” said company President Bill Gagne, who has nearly 30 years of experience in the automation industry. “We are adaptable, responsive, and committed to providing a 5-star customer experience.

“When Paul talked to me about the EV battery inspection project, it was a no-brainer to take on the assignment, especially because it would move us into an important new industry segment. While we had standardized on two other suppliers up to that point, one for electric automation products and one for pneumatic products, we were confident in Festo products because the company is known for its high quality. We had no idea, however, what

it would be like to apply Festo products into our machine design. Ultimately, I felt the risk of not knowing the products very well was outweighed by the features and benefits presented by Festo.”

An overview of the handling system

Harris Hill Automation was tasked with designing a handling system that safely and continuously feeds charged battery cells into and out of the inspection station. The cells arrive at the handling system via conveyor, in a tray that holds 48 cells per tray. From there, a three-axis cartesian gantry performs a pick-and-place operation, moving six cells at a time from the tray. The cells are picked with a custom end-of-arm-tool (EOAT) designed by Harris Hill Automation with six Festo pneumatic grippers. Immediately after picking, the bar code of each cell is scanned for the first time.

Next, the handling system places the six cells onto Harris Hill Automation-designed pallets that hold one cell per pallet. Each pallet travels down a driven connecting conveyor and is transferred and connected to the inspection system’s conveyor via cleats. Bar codes are scanned again. From there, each cell is inspected, and the results of each inspection are uploaded to the plant’s Manufacturing Execution System (MES) to conform with traceability requirements.

After the inspection process, cells are conveyed to the outfeed location where a second three-axis cartesian gantry reverses the pick-and-place operation, moving completed cells 6 at a time into an empty tray. Each refilled tray with 48 inspected, tracked, and traced battery cells is then conveyed to the next step in the end-user’s production process.

It is essential that this custom handling and inspection machine carefully avoid any mishandling of charged cells, such as dropping them or bringing them into contact with one another. Safe and reliable handling is a top priority in the process. The Harris Hill Automation machine utilizes both electric and pneumatic automation components from Festo to meet these requirements.

Handling Guide Online proved to be a valuable productivity tool

Festo provides the engineering tool [Handling Guide Online \(HGO\)](#) to assist users in the sizing and selection of multi-axis handling systems. Users enter basic application requirements such as stroke length, load mass, and cycle time requirements into HGO, and the tool offers a range of solutions, including good, better, and best solutions based on price versus performance. The tool does the work of sizing and specifying the electric axes, mechanical mounting plates, servo motors, drives, and accessories needed to meet the application requirements, with all products included under a single, unique part number for ease of use. At the end of the design process, which can take as little as 20 minutes, HGO provides 3D CAD files, a bill of materials, an anticipated delivery date, and a price for the complete system.

HGO also provides a digital commissioning file, containing all the necessary configuration data for the servo drives, motors, and axes, to further assist the customer upon delivery of the handling system. Using the free PC-based software tool, Festo Automation Suite, and the digital commissioning file provided by HGO, customers can quickly and efficiently commission the handling system at their facility.

“HGO sounded very interesting when I spoke with Paul about specifying the gantries,” Gagne recalled. “Early in the project, the handling system requirements were loose, which is one way of saying there were a lot of changes being made by the customer. Paul, along with his application team, pitched in to help us use HGO to find the best solution despite those changes. Safely handling the charged battery cells with speed and accuracy were paramount to the success of the machine. We went through HGO several times and with that initial support from Paul’s team, we felt confident we had landed on the proper specifications for the gantries.

“HGO accelerated the design and acquisition process, which saved us time and money,” Gagne said. “Rather than having one of our engineers manually calculate the correct actuators, servo motors, drives, and accessories for each gantry, HGO led us through the process and gave us confidence that we had a correctly sized system that met our budget for the job.”

The design team found that the Festo Automation Suite software, along with other sizing tools from Festo for pneumatic grippers, air preparation, and safety valves, were tremendously helpful to their design process. Festo provided Harris Hill Automation with servo motor, drive, actuator, and gripper samples to assist the design team in their prototyping and proof-of-concept efforts. “The samples gave us the hands-on experience we wanted as a first time Festo customer,” said Gagne.

CMMT multiprotocol servo drives were a surprise

[CMMT servo drives](#) feature one of Festo’s latest electric automation innovations, multiprotocol Ethernet communications, which allow a single servo drive to support multiple industrial Ethernet protocols: PROFINET, EtherNet/IP, EtherCAT, or Modbus. The desired protocol is easily selected by the user via rotary switch or the Festo Automation Suite software. Having this feature provides many benefits to the user, including fewer part numbers to inventory and manage, smaller bills of materials, shorter lead times, shorter learning curves for technicians, and the flexibility to switch protocols as needed.

Well into the project, Gagne said to Hubbard, “The customer wanted us to switch from Rockwell PLCs and EtherNet/IP communications to Siemens PLCs and PROFINET. I wondered how much it was going to cost me for new servo drives with PROFINET capabilities?”

“I said to Bill, it is not going to cost you anything, your drives are multiprotocol,” said Hubbard. “Until that moment we had simply not discussed the multiprotocol capabilities because it hadn’t been necessary. Bill and his team had no idea that they even had multiprotocol units much to Bill’s delight.”

“It was a seamless transition for the servo drives and much appreciated,” Gagne said. “We were impressed.”

An early adopter of the VTUX platform

Festo introduced its new flagship valve terminal [VTUX](#) in 2024. VTUX terminals provide integrated I/O and pneumatic valves for both centralized and decentralized (remote) machine designs. These compact and rugged IP65/67-rated terminals can be installed in the control cabinet or anywhere on the machine, boosting operational performance and OEM installation productivity. The key to the unparalleled flexibility of VTUX is its modular design. High flow sub-bases provide flow rates up to 670 l/min, while lower flow sub-bases are more compact and weigh less. Both sub-bases are supported by a single valve model, which simplifies ordering, stocking, and support. High flow rates and compact sub-bases can be mixed and matched on a single terminal. VTUX terminals support up to 128 valves with up to 128 solenoid coils, as well as vacuum capabilities.

The I/O side of the VTUX terminal offers similar flexibility. Each VTUX terminal can be configured with a mix of up to 15 digital, analog, and IO-Link master modules. The modular concept continues through to the method of connecting the terminal to the industrial Ethernet network. There are bus interface modules for PROFINET, EtherCAT, EtherNet/IP and Modbus. Users simply select the bus interface module to match their preferred protocol.

“Our distributor, Eastern Industrial Automation, and Paul spoke highly of the VTUX terminals,” Gagne said. “We did not realize we were one of the first OEMs in North America to use them. VTUX terminals provided a compact unit, which was great because space was at a premium and we wanted low weight and size for end-of-arm mounting. I love the fact that we have I/O modules, as well as valves, on the same terminal. Given all the features with these units, the price of the terminals was surprisingly competitive. We thought it would be more expensive.”

When the customer asked Harris Hill Automation to switch from Rockwell PLCs and EtherNet/IP communications to Siemens PLCs and PROFINET, Harris Hill Automation engineers found it was simply a matter of swapping out the bus interface module on each of the five VTUX terminals. Nothing else on the terminals needed to change. “On a project like this one, facing many changes, multiprotocol and modular flexibility delivered significant benefits,” Gagne said.

Overall impressions of partnering with Festo

“The customer’s satisfaction is how I gauge the success of a project,” Gagne said. “By that measure, we achieved success on this project. From an internal perspective, we were within our material and labor budgets. And we did it with a new supplier on equipment we had not previously applied”.

“The integration between the Festo servo drives, motors, and actuators has been seamless. With other brands, I have often had trouble during commissioning. With Festo, we powered up the axes and created smooth motion in a short amount of time. In my opinion, Festo quality and interoperability sets the industry gold standard. The time we spent designing and commissioning was accelerated thanks to HGO, Festo Automation Suite, and the Pneumatic Sizing tools. We had a few questions early on about the VTUX I/O modules, but once we had the full documentation, we commissioned those easily. It was helpful that the terminals arrived assembled and tested”.

“The support we received from Paul and his team, and our distributor, Eastern Industrial Automation, positively contributed to our solution. I think that Festo was as invested in the success of the machine as we were. It was clear to me that Harris Hill Automation was not simply a customer of Festo – Festo was our partner”.

Press Images



VTUX

In the raised position, the compact VTUX valve terminal, center, is visible with valves and I/O. This image also reveals how well the VTUX is suited for end-of-arm mounting and the size of the gantry.



Festo pneumatic grippers

Key components of the handling system include the custom tool with six Festo pneumatic grippers, lower center, the VTUX I/O module, top center, and X, Y, and Z axes transporting the end-of-arm tool.

About Festo US

Festo is a leading manufacturer of pneumatic and electromechanical systems, components, and controls for process and industrial automation. For 100 years with more than 50 in the U.S., Festo Corporation has continuously elevated the state of manufacturing with innovations and optimized motion control solutions that deliver higher performing, more profitable automated manufacturing and processing equipment. Through advanced technical and industrial education, Festo Didactic Learning Systems and its partners prepare workers for current and future manufacturing technologies.