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Lazlo Kleczewski | Intralox



Creative Conveying

EV battery manufacturers require easily scalable conveyor solutions – for smart control of the variable systems, Intralox developed the decentralized logic module ISC CAM with robust Turck block I/Os

E-mobility is currently shaking the global automotive market. Car manufacturers aren't alone in feeling impact of the increasing demand for alternative drive concepts, of which battery-powered electric vehicles are currently the most important. The whole supplier structure is challenged to meet changing demands. First and foremost the production of lithium ion batteries needs to keep up with the pace set by demand for electric vehicles. "We have customers that need to scale their operations very aggressively in order to meet the demands that the electric vehicle makers are going to need," says Martina Costa, Business Development Analyst for the Automotive Team at Intralox in Amsterdam, a company specialized in conveyance and material handling technology for numerous industries. "Battery manufacturers won't be able to do that just by building new greenfield plants. They will need to increase the throughput of their existing facilities."

The EV battery conveying solution: scalable, flexible, and pallet-free

Besides the increasing demand for scalability Intralox identified two other criteria that would separate the wheat from the chaff when battery producers look for the conveying solution to be installed in their next battery production plant: First and foremost is flexibility since the number of different types of batteries will

increase dramatically over the next five years. Plants need to be able to handle a large number of different types on the same intralogistics system. The equipment transporting the batteries through the production line needs to be able to handle a variety of weights, dimensions, and other differing properties. The third demand that Costa identifies is that manufacturers will need a solution without pallets and workpiece carriers, which increase complexity and the cost of the production line as the pallets need to be collected, returned, and checked continuously. Manipulating batteries directly on the conveyance surface reduces investment cost and time to market.

Intralox: conveying innovations

Intralox happens to be an inventor's company in the most literal sense, holding more than 1400 patents in force around the world. With an inventor as its founder, the focus has always been on developing new solutions where the patents add value. This is one reason for Intralox's concentration on technologies like their modular plastic belting for special purposes such as hygienic belts for carrying unpacked food. Their solutions are part of the logistics infrastructure of market leaders in almost any industry.

An example of this inventive spirit is the Intralox Activated Roller Belt (ARB) technology that the company pioneered 15 years ago. With conventional roller



With its demo loop in Shanghai, Intralox demonstrates that decentralized automation solves many problems of equipment manufacturers when integrating automation of their products into bigger systems

conveyors, so-called pop-up belts are used to separate goods or to move them perpendicular to the conveying direction. Those belts pop up between the rollers and are separately motorized to allow for lateral movement of the goods. One downside of this technology is belts in between the rollers do not offer support throughout the whole surface of the product and therefore limit the size of the items being conveyed.

Intralox's ARB technology solves this problem by using a belt in which small rollers are embedded at a certain angle to the direction of belt travel. Especially when high throughput and very sensitive handling and separation is needed, ARB equipment and especially DARB equipment can be a problem solver. DARB stands for a special version of ARB – the Dual-Stacked Angled Roller Belt – which is able to move items up to 90 degrees perpendicular to the line travel.

The DARB technology perfectly complies with the three critical demands for EV battery production logistics stated above: scalability, flexibility and ability to handle batteries directly without pallets. It improves scalability as it is able to increase the throughput of battery lines significantly compared to conventional pop-up belt conveyors by eliminating stop and start times before perpendicular movements. It is also more flexible as full width support removes most restrictions on item dimensions. The only limit set is the dimension of the belt itself. Smaller parts cannot fall in between

rollers like with standard roller conveyors. Finally, DARB equipment eliminate the need for pallets since they support the EV battery over the whole baseplate.

Problem: Central PLC solutions poorly scalable

Some lithium-ion battery manufacturers are already benefiting from the capabilities of DARB equipment in their production, as Martina Costa explains. But the company identified more room for improvement when looking for the optimal conveyor for the growing

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Machine builders that need to integrate their machines into higher-level systems often have the choice between two suboptimal alternatives: either integrating their controls in the main line PLC or building up a separate control cabinet with PLCs on each single machine. Both variants are not only complex and expensive, but also not scalable enough to meet the growing demands on modern intralogistics systems. Thus the belting and conveying specialist Intralox developed the Intralox Smart Carryway Automation Module (ISC CAM), an autonomous IP67 unit to control conveyors like the DARB Series 4500. Turck provided its TBEN block modules for the ISC CAM, IP67 PSU67 power supplies and color-coded cables for easy commissioning and cabinet-free installation.

Turck's large portfolio of IP67 I/O modules ensures a seamless, decentralized approach for modular machines and plants



ISC CAM: The decentralized Intralox logic on Turck's robust TBEN-S block modules enables a variable conveyor layout without complex control cabinet installation



Fast cabling, easy installation: The robust PSU67 power supply provides all required voltages directly on site

battery industry. Intralox is the OEM (Original Equipment Manufacturer) but the automation of DARB equipment is traditionally done by the integrator of the intralogistics systems using Intralox guidelines. "We realized that this process is not always efficient as much know-how is lost in communication. We sell DARB constantly, but the integrator only does it now and then. That could become challenging for all parties", explains Martin Benavidez, Intralox Product Manager for ISC. The acronym stands for "Intralox Smart Carryway", an innovative program that aims to develop an automation solution for controlling Intralox machinery, including the DARB product line. Benavidez is driving the project together with Lazlo Kleczewski as Product Design Manager for ISC.

Integrators choose to leverage another PLC available in the line to control the DARB equipment. The main drawback of having one PLC controlling several machineries is that debugging during commissioning and changes in the operation are time-consuming and risky. To solve this problem for the benefit of customers, Intralox expanded its offer to include automation of the DARB system. "We started using a separate PLC to automate the DARB, but is not cost efficient, especially in the small ones. We had to offer different PLCs and build big electric cabinets following many customer requirements and regional regulations. Product development and maintenance is complex because of this", explains Benavidez. He adds that using traditional PLC technology is difficult to scale because of the effort required to engineer and assemble the control cabinet and maintain different PLC platforms that have been established for years in factories. "Scalability is very important for us. Therefore we looked for a solution where we can channel our experience and knowledge gained over many years into a small device that is easy to use and carefree", Lazlo Kleczewski adds.

Solution: Decentralized IP67 controls bring flexibility

The solution is the ISC CAM (Intralox Smart Carryway controlled by a Carryway Automation Module), a small IP67 block module that contains Intralox' software logic to maximize the performance of the equipment without needing an electric cabinet. Turck's TBEN-S provides the hardware platform for the ISC CAM. Thanks to its multiprotocol capabilities, it can service a wide range of customers with minimal product variations. Turck's multiprotocol devices support the Profinet, Modbus TCP and Ethernet/IP protocols and adjust themselves to the Ethernet protocol spoken on the network without user intervention. This allows for an improvement for all parties involved. The integrator only needs to program his PLC to communicate a few basic instructions, thus reducing the effort and risk of integrating and commissioning DARB equipment. The end user will be ensured to always have the latest automation knowledge used in the equipment and can rely on the full Intralox support for DARB equipment. "The ISC CAM solves many of the problems that classical automation structure raised", says Lazlo Kleczewski.

DARB demo loop with decentralized automation

To showcase DARB technology as a key conveying solution for EV battery industry Intralox built a demo loop in Shanghai, where potential customers get an impression of the capabilities of the technology. In addition to that, the loop demonstrates the benefits of decentralized automation. Each piece of DARB equipment has its own ISC CAM for the carryway automation, and other key automation functions in the loop, like motor control and safety are distributed into other simple modules. The result is a high level of modularity of both the hardware and software improving set-up, troubleshooting, and modifications like adding or removing a conveyor.



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With this demo loop, Intralox demonstrates that decentralized automation solves many problems of equipment manufacturers when integrating automation of their products into bigger systems. Traditional solutions would require a cabinet for housing the HMI, motor controller and variable frequency drive, power supply, and other components that are not available in high electrical protection degrees. However, the ISC and the wide Turck portfolio of field modular components in IP67 offer solutions to these problems. Allowing the creation of more clean, flexible yet nimble solutions.

Full range IP67 portfolio for decentralized automation by Turck

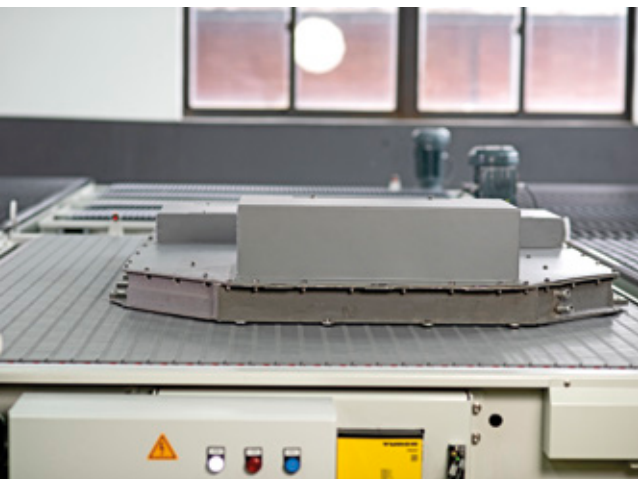
The loops HMI does not have the typical screen on the cabinet. "There is no need for a physical HMI because the loop can be controlled, adjusted and changed thru a 'virtual HMI' that is hosted in the web-server of the ISC. This is easily accessible with a laptop or any device with a web-browser", says Lazlo Kleczewski. The automation of the motors and safety systems in the loop is done decentralized by a combination of field controllers from the Turck TBEN product line. Thanks to the large portfolio of IP67 I/O components for serial and Ethernet communication the demo loop's cabinet is not bigger than a shoebox. It only incorporates some



Fast and trouble-free cabling is promised by the M12 connectors with color-coded rings for poka-yoke connections

safety components. The ability of Turck Ethernet solutions to communicate with either Profinet, Ethernet/IP or Modbus TCP dispenses the development of individual solutions for customers in different regions. Turck's robust power supply unit PSU67 simplifies the supply of the 24 VDC for running the automation components.

There are other benefits of this 'integrated and holistic design' that Intralox proposes. For instance, not having a cabinet reduces parts, but also allows to eliminate cables with loose-ends making the concept virtually plug and play. By using color coding on the connectors, a high level of poka yoke is created thus minimizing the chances of mistakes. Therefore the cabling and wiring of the equipment becomes simpler and intuitive and almost impossible to connect it wrong. "We are trying to demonstrate that it is possible to take these complex systems and make them simple and intuitive. The only thing it requires, is to think slightly different", the ISC team resumes.



Supporting EV battery modules throughout the whole surface is one key advantage of DARB technology as the demo loop in Shanghai shows

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