

Filling Perfection

Elopak relies on IO-Link and ultracompact block modules from Turck for its new Pure-Fill filling machine platform – thus increasing commissioning speed, flexibility and cost efficiency

Everyone has probably held it in their hands before: the “Pure-Pak” beverage carton from Elopak. As one of the world’s leading system suppliers of carton packaging and filling machines, Elopak from Spikkestad, Norway, offers innovative packaging solutions made from renewable, recyclable and sustainably sourced materials. The German subsidiary Elopak GmbH develops and produces filling machines at its Mönchengladbach site. The highly specialized systems open out the carton, dose the liquid and fill it aseptically in order to finally seal the beverage cartons airtight. The systems are self-cleaning without the need for any dismantling. The beverage cartons are filled directly at the installation site in compliance with the highest hygiene standards.

New machine generation with a wide application range

The new Pure-Fill machine platform, based on the predecessor model E-PS120 A, is designed to be particularly flexible and adaptable to suit customer requirements. “Our primary goal was a modular machine that can be easily adapted to specific customer requirements while retaining the same overall design,” explains Horst Klesse, manager electrical design, product & development at Elopak. The new filling machine platform must be flexible in order to cover a wide range of applications – beverages with a low acid content such as milk or those with a high acid content such as fruit juices, in different volumes such as one or two-liter cartons, at filling speeds of up to 14,000 beverage cartons per hour and production on two to five lanes.

More flexibility with the same footprint

When integrating IO-Link into the machine platform, the overall size of the system should remain the same



Modular and compact: The new Elopak machine platform PureFill-60AL can be easily adapted to different product and customer requirements

despite the increased flexibility. Elopak already used IO-Link to some extent in the predecessor machine in order to reduce wiring and commissioning costs. IO-Link was used here in the so-called process node, which is located at the top of the machine and controls all media and product flows with 34 IO-Link enabled valve heads. Thanks to IO-Link, only eleven cables had to be connected to the control cabinet in the process node instead of the original 375 individual wires and 73 cables. “In the new platform, we wanted to use IO-Link consistently throughout the entire machine, but the size of the master modules previously used was a problem,” says Horst Klesse, describing a challenge during development. “Devices without an IO-Link connection also had to be integrated into the system.”



Communication problems with the control of the valve heads presented the team with a further challenge. "This previously led to considerable additional work for the software engineers during programming and commissioning," says Klesse. "As a result, we looked for an alternative solution." The diameter of the M12 supply cables of the IO-Link masters previously used meant that they were also too rigid to connect modules placed very close together.

Compact IO-Link master: space-saving and combinable

Turck's TBEN-S2-4IOL, TBEN-S2-4AI and TBEN-S2-8DXP multiprotocol I/O modules and the IP67 8-port Ethernet/IP switch provided the solution. With a width of

QUICK READ

Elopak develops and produces filling machines for beverage cartons in Mönchengladbach. The packaging specialist uses IO-Link as the basic technology for the automation of its new Pure-Fill machine platform. The decision to choose Ethernet and network components from Turck was based on their flexibility as well as the simple wiring and seamless integration in the Profinet engineering. The ultracompact multiprotocol I/O modules TBEN-S2-4IOL, -4AI and -8DXP, as well as the TBEN-LL-SE-M2 Ethernet switch were particularly impressive.



Masterclass: Turck's IO-Link Master TBEN-S2-4IOL enables the efficient use of IO-Link and digital I/Os in an ultra-compact assembly group at the process node for cooling the machine

just 32 millimeters, the ultracompact TBEN-S2 devices are ideal for systems with limited space. This means that module groups can be easily mounted at different points in the system – even directly on the profile rails. The use of smaller M8 connectors and thinner cables allows easy connection – even if the modules are mounted directly next to each other and connected with small bridges. “The requirements for the optimum IO-Link master for the filling machine platform were a compact design, multiprotocol capability, M8 power supply, Profinet connectivity, suitable connection options and a wide range of mounting options,” Klesse explains. “The TBEN-S2 modules from Turck meet these requirements best of all.”

The TBEN-S2-4IOL master module has four Class A IO-Link ports and digital I/Os. Despite its compact form factor, it offers a wide range of communication options and enables easy integration of IO-Link devices in the Profinet engineering without additional software, thanks to Turck's “Simple IO-Link Device Integration” SIDI. Up to four sensors or I/O hubs can be connected via the IO-Link master channels, enabling a total of up to 64 sensors to be connected. The two four-pole M8 Ethernet/fieldbus connections enable flexible commu-



The I/O modules of the TBEN-S2 series are only 32 mm wide and allow flexible group mounting in a wide variety of locations



Turck's TBEN-LL-SE-M2 Ethernet switch (above) with eight 100 Mbit and two Gbit ports for fast and secure data transmission in the machine

nication via Profinet, EtherNet/IP and Modbus TCP, while the integrated Ethernet switch allows straightforward cabling using a line topology. The built-in web server simplifies diagnostics and commissioning, making the TBEN-S2-4IOL extremely versatile and considerably facilitating the integration of devices.

The identically designed TBEN-S2-4AI offers a powerful solution for applications that process analog signals. With four analog inputs that can be configured for voltage, current, RTD or thermocouples, it enables a versatile adaption to different requirements. Each analog input can be configured individually, allowing flexible use. The universal use of these analog modules is unique on the market. As only one type of module is required to process all common analog value types, this also simplifies spare parts inventory and ultimately machine maintenance. The integrated Ethernet switch simplifies cabling and optimizes communication.

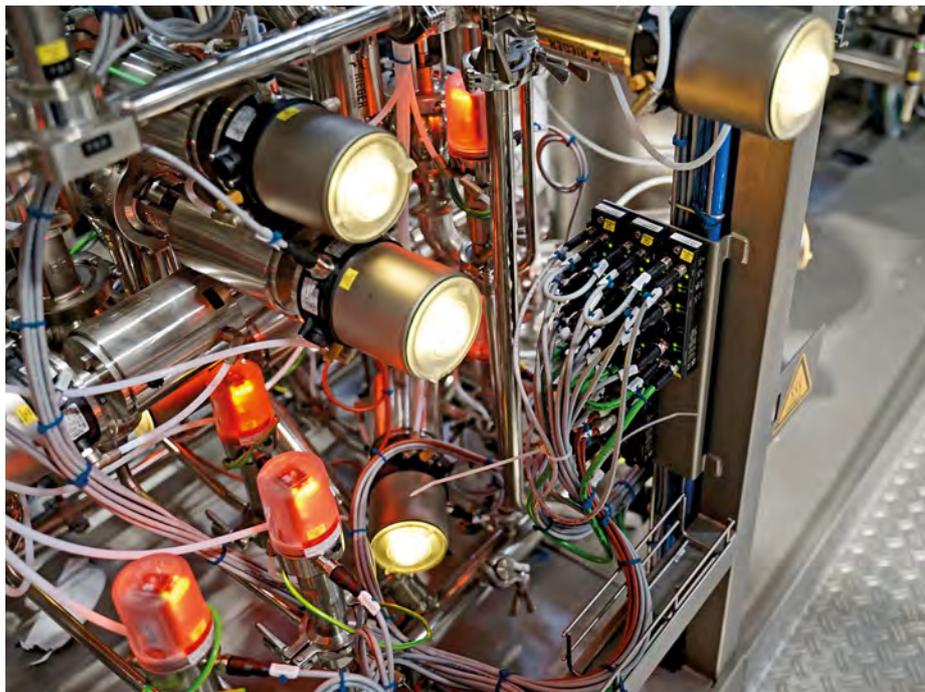
The TBEN-S2-8DXP is Turck's compact solution for applications that need to process digital signals. With eight universal, digital channels, configurable as PNP

SIDI – universal key for Profinet engineering

Turck's Simple IO-Link Device Integration, or SIDI for short, simplifies the handling of IO-Link devices in Profinet engineering systems. As the devices are already integrated in the GSDML file of the master, users can select the devices from the device library (for example in the TIA Portal) and integrate them in their projects via drop-down fields as if the devices are submodules on a modular I/O system. The user benefits from access to all device properties and parameters in plain text. Measuring ranges, switch points and pulse rates can be set directly from the engineering system – without any programming or additional software required.

input or 2 A output, this module also enables application-specific adaptations. The diagnostic functions of the supply per I/O port and the output diagnostics per channel ensure reliable monitoring and fast fault detection. "We can supply the machine with just three small modules that are identical in terms of shape, size and connections," emphasizes Klesse. "This makes it possible to install even simple sensors without IO-Link. Groups of four to six or even more devices can also be easily formed in the system and connected with the thinner M8 cables." As a special feature, the module offers a third switching output on each M12 port, i.e. a total of 12 switching signals. This enables lights with three segments, for example, to be connected and controlled via a standard cable.

The uniform design of the TBEN-S2 modules in terms of dimensions and connections allows the user to easily replace modules without having to make complex changes to the system – regardless of whether analog, digital or IO-Link devices are required. "We can mix and match modules without having to worry about power supply, connections or space



The process node controls all media and product flows of the plant with 34 valve heads, Turck's compact TBEN-S modules ensure efficient communication paths



»The compact TBEN-S2 devices from Turck proved to be the ideal solution for our application, as there are no comparable alternatives.«

Horst Klesse | Elopak

requirements," Horst Klesse emphasizes. "This flexibility has simplified our planning and installation considerably. We can simply tell the mechanic how many modules we need without committing to a specific type in advance. This enables us to configure the system in an agile and efficient way."

Installation time reduced by more than 50 percent

One of the biggest advantages of the IO-Link solution is the reduction in installation time by over 50 percent and commissioning time by 30 percent. This considerable time saving not only reduces production time, but also overall costs. Offline parameterization of the IO-Link devices directly from the Profinet engineering considerably simplifies commissioning and ends time-consuming manual settings of sensors and actuators. Maintenance is also significantly simplified: As all device properties and parameters of masters and devices are directly available in the central project file of the controller, automatic device replacement in the event of damage can also be carried out easily without any problem – both for IO-Link masters as well as devices.

Outlook

By consistently integrating IO-Link technology, Elopak has been able to significantly increase the efficiency and flexibility of its machines. Rapid commissioning and simple device configuration improve competitiveness and profitability. The machine platform is moreover now equipped for future predictive maintenance solutions. "The decision to work with Turck has proven to be absolutely right," says Horst Klesse. "We were just as impressed by the competent contacts and reliable support as we were by the handling of the modules and the wide range of options. The compact TBEN-S2 devices from Turck have proven to be the ideal solution for our application, as there are no comparable alternatives."

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