

Seamless integration of CAD files into the automation platform

Fully automated production of pre-stressed concrete elements

The use of pre-stressed concrete elements, which are delivered cut-to-size and already include the necessary cutouts for plumbing and lighting, is common in construction projects today. The hollow-core components are superior to alternative ceiling designs because they require less concrete while delivering the same load-bearing capacity. Echo Precast Engineering, a member of the Progress Group, specializes in building machines for the production of such elements. Flexibly adaptable and equipped with the latest control technology, the machines make it possible to manufacture custom-tailored elements with a high degree of efficiency. The PC-based controllers not only run the equipment, they also determine the cutout positions and other details based on architect drawings.



The hollow-core slabs are cut to size and shipped to construction sites with pre-cut openings for plumbing and electrical lines.

Echo Precast Engineering in Houthalen, Belgium, is a renowned manufacturer of machines for the production of pre-stressed concrete building materials up to 2.4 meters wide and 120 meters long. "We serve a very special market," says Jo Nijs, automation engineer at Echo Precast Engineering. "The machines operate in rough environmental conditions, yet must maintain exceptional precision."

CX2020 Embedded PC controls concrete extruder

The latest machine developed by Echo Precast Engineering, the X-Liner®, is an extruder that uses augers to press concrete into a mould while it glides along a track. "To ensure consistent concrete strength and short drying times, we must control the density of the material with a relatively complex algorithm. Compressing the concrete through vibration, while compensating for potential variances in the concrete's composition and quantity in the hopper, is part of our core competencies. Let's not forget that concrete is a composite product with varying properties," explains Jo Nijs.

"We have standardized on Beckhoff automation technology within the Progress Group, which includes Echo Precast Engineering," says the automation expert. "The PC-based control platform delivers the reliability and flexibility we need for our machines. In addition, Beckhoff is a global player, just like we are. This means that we can support our customers wherever they may be, sourcing replacement parts on short notice.

"Our machines are designed in such a way that all the intelligence resides in the controller. This makes it possible to switch out components with minimal configuration effort. Since the market for prefinished floors made of pre-stressed



Echo Precast

Echo Precast Engineering, headquartered in Houthalen, Belgium, develops and builds machines and systems that produce pre-stressed concrete elements. With its technological expertise, the company has made a name for itself all over the world. Echo Precast Engineering is a subsidiary of the Progress Group, a supplier of technology solutions to the precast concrete industry.

The machine is operated via a CP29xx multi-touch panel. The communication between the CX2020 Embedded PC and the Control Panel runs over the long-distance CP-Link 4 connection technology.

concrete requires an infinite number of variations, short setup changeover times are extremely important. The X-Liner® can be fully reconfigured by a single operator in less than 30 minutes,” says Jo Nijs.

Application software runs side-by-side with the PLC

Immediately after the X-Liner® has formed a floor element, another machine, the plotter, moves along the track and indicates with paint the location of the hollow core slabs, as well as openings for plumbing lines and other conduits which are cut in the next step. The plotter operates completely autonomously. The markings are specified in a PXML file that is generated based on the architectural drawings. Stef Verhelst, engineer at Echo Precast Engineering: “The file is downloaded to the CX2020 controller via Wi-Fi or a USB memory stick. The Echo control software translates the data into the coordinates for the plotter. These coordinates are sent to the PLC, where they are used to control the plotter’s X and Y axes.” Johnny Vangeel, sales manager at Beckhoff Belgium, adds: “The PC-based platform makes a huge difference during this step. The application software, which was developed under Windows 7, can run on the CX2020 parallel to the PLC environment. The PC environment and the TwinCAT PLC communicate with each other via TwinCAT ADS. The PLC receives an ADS address from which it can read the coordinates as calculated by the Echo control software.”

Compact, economical and highly dynamic drives

Because of its reach of 50 centimeters, the plotter moves along the concrete element to be marked at a speed of 1.5 meters per minute. Beckhoff sales engineer, Bert Cuypers explains: “The machine is equipped with an AX5000 EtherCAT Servo Drive for the wheels and AM8000 servomotors featuring One Cable Technology (OCT) to drive the axes. The plotter also features a Z-axis to accommodate the thickness of the hollow-core slab. The servomotor for this axis is controlled via an EL7201 servo terminal.” Since the CX2020 handles the complete motion control application in a closed-loop control circuit, drives, encoders and other components can be replaced without any further programming or adjustments.

Precise positioning saves materials

While the machine moves, the controller receives feedback from encoders embedded in its wheels. The plotter is also equipped with a laser sensor that very accurately determines its absolute position in relation to a reflector permanently

mounted in the production facility. “When we move the machine up and down the entire distance of 120 meters, the positioning remains accurate down to 1.5 millimeters,” says Jo Nijs. “That’s far more accurate than what building standards require. But it is important for our customers, as it helps them save raw materials.”

The strategy of combining all intelligent components in the control platform also applies to the visualization system. The machines are equipped with a CP29xx multi-touch Control Panel that provides the operator interface. Communication between the CX2020 and the Control Panel, which is installed at a distance, runs over CP-Link 4 connection technology from Beckhoff.

PC-based control technology enables advanced features

Since 2014, Echo Precast Engineering has also used the CX2020 as the controller for its sawing machines. They run along a track like the plotter, but must still be positioned manually at this time. To make a cut, the operator aligns a laser-projected beam with a marking that was previously applied by the plotter. However, Echo Precast Engineering is already working on the next step. In the future, the saws should be able to use the same PXML files so that the positioning markings will no longer be needed. “Since the PC-based controller can handle this easily, this is the next logical step,” explains Jo Nijs. “An additional benefit of the PC-based control system is that our machines have TeamViewer software installed, which allows us to log into our customers’ machines and even carry out actions in real time.”

Further information:

www.echoprecast.com

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