



PC-based control in window and door production

# Motion control and electric cylinders replace manual process steps

Using a unique machine concept, Belgian machine builders CNC Solutions and Calvet are automating previously manual processes in aluminum window and door production. High-performance drive technology, motion control, and the AA3000 electric cylinders from Beckhoff proved crucial in equipping the machine with the necessary finesse when pressing the window frames.

Zellik-based machine builder Calvet N.V. aimed to extensively automate various processes in window and door production with a new machine concept. "Together with CNC Solutions, a machine builder specializing in customized systems like Calvet, and the specialists from Beckhoff, we were able to bring this sophisticated concept to life," explains Stefan Nees, managing director of Calvet. "We were delighted to contribute our expertise in CNC and robot applications," adds Lander Debruyne, managing director of CNC Solutions BV in Menen, Belgium.

## Quality and productivity boost in window construction

Until now, the method of joining aluminum window profiles has involved corner presses. A number of manual steps are still necessary in advance, requiring production teams to exercise great care to assure the final quality of the window or door frame. "We have combined and automated these manual

steps, namely assembly, gluing, pressing, checking, and polishing, at a central workstation," notes Stefan Nees.

In the future, the operator will place the window frame profiles on a mover. Sensors then check that the correct parts have been inserted and that they fit together. Once approved, the profiles are positioned, clamped over brackets, and then pressed together with the required force. "This automated process allows us to raise the bar in terms of quality and really boost the efficiency of our window production."

## Three electric cylinders make one gripper

In addition to quality and productivity, flexibility was another top priority for the machine specifications. After all, there are various profile types, pressing

positions, and bonding techniques to consider. This is why two 6-axis robots serve as the core of the installation. Depending on the size of window being produced, which ranges from 300 to 4,500 mm, the robots are positioned and ready to automatically pick up the corresponding tool for each production step. "What really sets our process apart is the special gripper for pressing the corners together," enthuses Lander Debruyne. Three AA3000 electric cylinders with spindle drives form the basis of the gripper. "By evaluating the currents and torques of these drives, we were able to give the machine a sense of the pressing force and control it dynamically," clarifies Stefan Nees.

It is no coincidence that CNC Solutions uses PC-based control and other components from Beckhoff for the machine. Lander Debruyne explains, "We switched to the Beckhoff platform and CX2043 Embedded PCs as standard controls around two years ago because we were constantly having availability problems with our supplier at the time." CNC Solutions also uses Stäubli robots as standard, which can be integrated and efficiently controlled via EtherCAT and uniVAL drive. "Changing the control technology is not something that can be done overnight," says Lander Debruyne, "but with application engineer Maarten Knevels by our side, we always had a true expert on hand." As many as seven machines with PC-based control are now being used by customers. "Our application engineers provide support during the transition period to ensure a seamless launch and even help existing customers to implement new technology," adds Cédric Sabbe, account manager at Beckhoff Belgium.

In addition to the robots, 15 CNC axes (AM8000 servomotors and AA3000 electric cylinders) are controlled via TwinCAT 3 and the AX8000 multi-axis servo system. Calvet and CNC Solutions also use EtherCAT Terminals along with numerous EtherCAT Box modules with an IP67 protection rating to read the signals and control the actuators, which are mounted directly on the movers. Cédric Sabbe notes, "The compact drive system coupled with the OCT connection technology of the servomotors have facilitated a space-saving and swift installation."

## Flexible combination of robots, CNC, and motion control

"The major challenge of this project was to ensure every last process was perfectly coordinated," says Stefan Nees. This is precisely where TwinCAT 3 NC PTP, NC I, and CNC came into play to manage the demanding coordination of all axes. The operator receives instructions for order setup via the CP2918 Control Panel and can use it to track machine operations. The order data is loaded from the central order management system via a barcode on the window profiles. Calvet achieves the necessary connectivity with the bar code scanner and IT via TwinCAT 3 Serial Communication (TF6340) and TwinCAT 3 Database Server (TF6420). "To keep operation as simple as possible, there are just two buttons allowing the machine operator to navigate to the next or previous step," says Stefan Nees. It couldn't be any simpler.

The first system has been set up at a window manufacturer in Brussels, where the machine is being put through its paces in the field. "This practical feedback will help us to develop the prototype even further into a high-performance standard machine," concludes Stefan Nees.



The compact AX8000 multi-axis servo system controls the AM8000 servomotors and AA3000 electric cylinders.



Prior to pressing the frames, the fixings are positioned according to the window size.



CNC Solutions has been using PC-based control and CX2043 Embedded PCs to control a wide variety of projects for the last two years.

More information:

[www.calvet.eu/en](http://www.calvet.eu/en)

[www.cncsolutions.be/en](http://www.cncsolutions.be/en)

[www.beckhoff.com/window-production-machines](http://www.beckhoff.com/window-production-machines)