



The high-speed blow molding machines from ThreePlus Blow-tech Co. Ltd. are equipped throughout with the industry-specific Beckhoff Blow Molding Controller. A Panel PC supported on a mounting arm enables user-friendly operation and monitoring of the machine.

## Optimized production using Blow Molding Controller

ThreePlus Blow-tech Co. Ltd., based in Zhanjiang, China, specializes in the design, manufacturing and sales of fully automated blow molding machines for a wide range of applications. The control standard for the company's complete range of machines is PC-based Control from Beckhoff. The PC-based automation platform and the technology software for blow molding machines, the "Plastic Application Framework," together form an ideal combination for the production of high-quality plastic items. Equipped with a .Net-based user interface, ThreePlus has a high-performance Blow Molding Controller at its disposal.

ThreePlus's product range includes machines for the production of plastic packaging ranging from 50 ml to 10 l for the consumer market, plastic containers with a capacity of up to 220 l for industrial use, as well as water tanks, toys etc. "Our high-speed blow molding machines have a good reputation, both in China and abroad," says Li Jiang, electrical engineer at ThreePlus. The company exports its machines to more than 20 countries, including European nations, Canada, Egypt, Nigeria, India, Thailand, etc.

### Integration of wall thickness control and temperature control into one device

The decisive criterion for choosing Beckhoff was, among other things, the openness of the PC-based control platform: "The integration of the control of wall thickness

and temperature into the machine controller allowed us to simplify the system architecture," explains electrical engineer Li Jiang. In place of special modules, the Beckhoff Blow Molding Controller with the CP6202-1026 built-in Panel PC takes control of all machine functions. The electrical signals from the sensors, valves and motors are acquired and output via the EtherCAT I/O system using two EK1100 coupler stations. "Eliminating special modules increases the availability of the machine for us while at the same time reducing service expenditures and spare parts stocking," stresses Li Jiang.

Control is effected by the TwinCAT PLC automation software on the basis of Windows CE. Together with the TwinCAT PLC Fullscale Framework for blow molding machines, it is possible to realize fast movements and precise positioning of the hydraulics as well as accurate temperature control with minimum overshoot.

The software temperature controller has an intelligent auto-tuning algorithm, which facilitates the smallest possible overshoot when changing set values. "In comparison with hardware temperature controllers, this provides many advantages for commissioning and diagnostics," explains Li Jiang. "The controller parameters are saved and can be used for further machines. This saves us a great deal of time in determining the parameters for sluggish temperature zones." In addition, the software controller offers a high degree of flexibility in the fulfillment of customer requirements: Additional heating zones can be implemented easily, since the software is prepared for a maximum number of zones and only additional I/O terminals need to be installed.

### Maximum profile accuracy results in highly consistent product quality

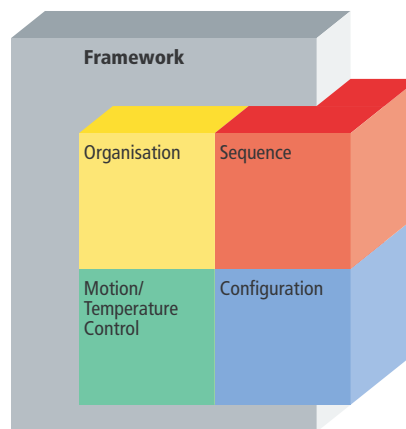
The wall thickness control essentially determines the quality of the final product. Since this controlled system possesses a high natural frequency, short sampling times are essential. EtherCAT and the high-performance Beckhoff Industrial PC fulfill this requirement perfectly. In the case of ThreePlus, the controller uses a sampling time of 2 ms. Depending upon requirements, however, the Beckhoff Blow Molding Controller is also capable of sampling times of less than 1 ms. The maximum number of profile points is 400. The profile accuracy is thus increased to a maximum in order to produce plastic items of a consistently high quality.

Short cycle times are achieved by the optimum control of the transport movement and the clamping unit, among other things. The Blowmolding Framework uses the proven motion modules from the TwinCAT hydraulic library for this, in order to obtain an optimum balance between fast movement and accurate positioning. "The Beckhoff control system can precisely control the wall thickness of the parison for products with very demanding requirements," says Li Jiang. "Our machines run faster and achieve greater positioning accuracy with the Blowmolding Framework from Beckhoff."

### Optimized user interface for blow molding machines

The productivity of a machine depends, among other things, on how quickly the operator can intervene in the running process and that the information needed for this is available at a glance. The Blow Molding Controller, which was specially designed by Beckhoff for blow molding machines, is equipped with over 40 manual operating buttons, which are partly assigned to the right and left sides of the machine. The buttons are labeled using the push-in strips and can be adapted to each respective application. A 15-inch touch screen displays all information in a clear format.

"The Beckhoff user interface for blow molding machines is the result of many years of experience with the process and the fulfillment of the wishes of the 'man at the machine,'" explains Thomas Kosthorst, Business Manager Plastic Processing Machines from Beckhoff. "Therefore, particular importance was placed on a clear structure when designing the user interface. The operator finds important data in the same place on each page. In addition, soft key functions support intuitive operation." The permanently displayed status field contains the most important process information, such as cycle time, extruder data or piece counters, and is configurable. This means that the operator specifies which data are to be permanently displayed, allowing them to ascertain the machine's status at a glance. "The central control side of the Blow Molding Controller is the wall thickness editor, which contains all important functions for the fast, clear creation of the wall thickness curves. Support points and curve segments can be represented in an easily recognizable manner by means of colored graduation. The curve shape is changed by pointer with the aid of the touch screen. Of particular interest is the "undo" memory, with which the operator can easily cancel the last changes that were made," explains Thomas Kosthorst.



Beckhoff supplies a software framework for plastics machines based on the TwinCAT engineering tool. Thanks to the open architecture and modular structure, the development time is shortened and complex machine concepts are supported. However, customer-specific know-how can also be combined easily with the tried-and-tested Beckhoff technology modules.

### All control functions are centrally available

"The Beckhoff Blow Molding Controller offers us important functions, such as user administration with different access rights, change of language and the ability to save operator inputs. The fact that all functions are centrally available is a further advantage of the integrated control system," says Li Jiang, and he adds: "Thanks to the universal control solution from Beckhoff we have been able to improve the machine performance and the quality of the products, while at the same time lowering production costs. This represents a decisive advantage with regard to ThreePlus's competitive ability."

### Blowmolding Framework simplifies system monitoring

"The old control architecture with special modules in combination with standard PLCs provided only minimal options for system diagnostics," says Li Jiang. Alarm and diagnostic functions are implemented by the integration of all functions in the Beckhoff Blowmolding Framework, as a result of which downtime is minimized and user-friendliness is significantly improved. In addition, the Framework offers the user the option of integrating special alarm modules by means of simple settings. "Programming is accomplished with structured text in accordance with IEC 61131, so that the operator only needs to have basic knowledge of programming in order to understand the machine programs. That makes it easier for us to maintain product quality and to update products," says Li Jiang. "The high-performance, clearly structured and flexible HMI interface allows us to implement the user and recipe administration as well as the documentation of all changes during production. In addition, there is the possibility to transmit production data to the customer's ERP network."

### Remote commissioning and maintenance

Thanks to the universal Ethernet connection, the machine can also be commissioned by remote control. "We export our machines worldwide, so the remote functionality represents a considerable advantage and saves a great deal of labor costs, since it enables us to remotely carry out commissioning or maintenance," says Li Jiang.

ThreePlus Blow-tech Co. Ltd.  
Beckhoff China  
PC Control for Plastics Machines

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