High-precision parison control using EtherCAT

PC-based Control of blow molding machines

The plastics industry in China has been booming for years. With increasing raw material prices there is increasing demand for faster and more precise controllers that help save raw material. Akei Industrial Park, based in Kaiping, China, therefore uses PC- and EtherCAT-based control technology from Beckhoff in its blow molding machines. High-precision sampling times and fast control cycles ensure precise parison and temperature control.

Akei not only produces plastic containers with capacities between 0.5 ml and 1000 l for a wide range of applications and industries, but also manufactures blow molding machines.

Almost unlimited system architecture freedom

In order to optimize raw material consumption and increase production output, Akei decided to use a Beckhoff Embedded PC and EtherCAT as communication system for the latest generation of its blow molding machines, which operate around the clock, seven days a week. In the past Akei had used a control system that required special hardware modules for temperature and Motion Control. The control hardware used to be installed in the main control cabinet. System extensions necessitated additional modules.

"The modularity and signal variety of the Beckhoff I/O systems now enable Akei to use a modular control concept, based on the individual requirements of the application. Different machine sizes and alternative drive concepts with servo axes can be integrated without problem," said Simon Tam, Managing Director of Akei.

In the past, all blow molding machine cables, whether for temperature sensors, position sensors, other control signal transmitters, valves or heating outputs, had to be connected to a central control cabinet. Utilizing the modular Bus Terminal system, installers no longer have to find space for numerous cables in the control cabinet. All signals can be logged or output locally near the process periphery. The blow molding machines from Akei are equipped with four compact electrical boxes for Bus Terminals as standard. One of the boxes is located on the left of the machine, another one on the right; a third electrical box links the hydraulic unit. A fourth box is located on the platform and provides the signals for temperature control. By using these decentralized units the cable routes can be shorter, which not only reduces the wiring costs, but also improves signal logging for temperature and parison control.

Design freedom beyond the hardware

The flexibility and expandability of the modular automation system from Beckhoff not only applies to the hardware wiring, but also shows in the software. Depending on the process requirements, the user can specify the resolu-

The Akei Group, based in Hong Kong, has been operating successfully in the blow molding machine sector since 1974 and has decades of experience in designing and manufacturing plastics processing machines. The Akei Industrial Park at Kaiping in the Chinese province of Guangdong opened in 1998. Here, blow molding machines are built, mold blanks are developed and plastic components are produced in an area covering approx. 80 hectares.

tion of the parison control with 100 to 400 points. The drive technology is also freely selectable. TwinCAT automation software supports both hydraulic and servo-electric axes. In hybrid architectures both concepts can be used in parallel.

Software designed by Beckhoff for blow molding machines, the TwinCAT Blow Molding Framework, handles almost all the functions required for controlling blow molding machine processes. Akei benefits from the long-standing experience of Beckhoff with control technology for hydraulic axes and heating zones. Significant improvements were achieved particularly in terms of the difficult transport movement, which influences machine productivity directly. Servo-electric axes, e.g. for handling tasks, could also be integrated without excessive engineering effort. All the machine manufacturer's programmer has to do is select the axis type and the sensors, and optimize the parameters. The TwinCAT Blow Molding Framework does the rest.

The application of high-efficiency servo axes, instead of hydraulic axes with high power dissipation, is the right step both from an environmental and economic perspective, which is also in line with market trends. Open, PC-based Control technology offers the machine manufacturer freedom to implement energy-optimized solutions based on unique process requirements.

Field-proven Panel PC for blow molding machines

The market success of blow molding machines increases with acceptance on the part of the machine operators. The Beckhoff Blow Molding Panel PC CP6202-1026-0010 provides all the industry-specific functions for operating a blow molding machine. The user interface developed by Beckhoff is based on many years of experience with blow molding processes and direct feedback from machine operators. The result is a clearly structured, ergonomic user interface. Important process information is displayed in a status box in the same location on each screen. The operator can configure the content of the status box according to their priorities. Parameters such as cycle time, critical temperatures or an item counter can be displayed.

The main operating feature of a blow molding controller is the wall thickness editor. It contains all main functions for quick and clear preparation 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. An "undo memory," which enables the operator to cancel recent modifications, facilitates machine settings in critical situations.

In addition, the Beckhoff blow molding controller offers important functions of modern user interfaces such as user management with different access rights, language selection and storage of operator inputs. This is a further benefit of an integrated control system, since all functions are available centrally.

Remote service enables prompt support in the event of malfunctions

Akei supplies machines to countries around the globe, in particular to the emerging economies in Asia and Africa. This poses particular challenges in terms of service and support because customers in any location expect rapid support in the event of a machine malfunction. The Beckhoff blow molding controller offers ideal prerequisites to achieve this: Akei service technicians can offer customer support for commissioning or troubleshooting from any location.

Further Information:
Akei Holdings Co. Ltd. – www.akei.com.cn
www.beckhoff.cn

The Beckhoff Blow Molding Panel PC CP6202-1026-0010 provides all the industry-specific functions for operating advanced blow molding machines.

Extrusion blow molding can take place in continuous or discontinuous mode. In both cases it is a multistage production process, which involves production of thin-walled hollow thermoplastic bodies, such as PET bottles or plastic containers. The base materials are fed into a heated cylinder, homogeneously mixed with a screw, and subsequently transferred into a "blow tube" via extrusion. The tube is then clamped with a cavity, in which the parison is inflated with air. During this process the blow tube takes on the shape of the inner wall of the cavity. Once the plastic melt has cooled down and solidified, the blow mold cavity opens, and the finished item is ejected.