Increasingly shorter production cycles are affecting production, packaging and logistics. Traditional production technologies with manually controlled sequences not only generate more costs in such an environment, they frequently also pose safety risks for operators. Advanced automation and smart factory concepts are therefore essential if users want to make packaging processes more efficient and improve workflow safety while reducing costs and speeding up setup changeovers.

Shanghai Triowin Intelligent Machinery Co. Ltd. is one of China’s leading suppliers of systems for the robot-based processing and packaging of food items. To continuously improve and advance its automated packaging lines, Triowin cooperates closely with Beckhoff and uses its PC-based control technology for Delta robots in intelligent packaging systems, among other things.

Open platform improves compatibility
The cooperation with Beckhoff began in 2011 with the joint development of Delta robots. According to Triowin, the open automation platform was able to meet all requirements at the time, especially in terms of the Delta robots’ compatibility with other manufacturers’ packaging components, which enabled Triowin to adapt the robots flexibly to customer-specific and volume production requirements.

For Triowin, this helped open up new markets and improved its access to more high-margin customer segments. One of the first products of this cooperation was an intelligent PC-controlled packaging line that integrated transport, removal, packaging and palletizing operations.

Intelligent and IoT-capable machine communication
Wuyun Xiao, responsible project manager at Triowin’s Robot Research Institute, emphasizes that the company employs a wide range of Beckhoff technologies for intelligent and IoT-capable machine communication. One of these components is the high-performance CX2040 Embedded PC that processes the algorithms for controlling single and also multiple robots. The integrated PLC supports the standard IEC 61131-3 programming language, which simplifies the integration of peripherals and lowers the costs of the control technology.

End customers in the food industry are demanding ever more flexible packaging lines as products and their packaging are changing at a rapidly accelerating pace. Triowin develops complete systems for such applications that rely on PC-based control from Beckhoff because the universal and open control technology makes it easy to integrate peripheral components and offer additional services. In this way, Triowin can implement new concepts for additional markets quickly and efficiently.
Another plus, says Wuyun Xiao, is the fact that “the devices are easy to install, and due to the interfaces with common fieldbus systems they are available in many different versions, with no compatibility problems in terms of communication. But the most important argument for selecting Beckhoff products was the openness of the TwinCAT engineering and control platform.”

Powerful and flexible Delta robots

The controllers conventionally used for Delta robots in China are limited by their maximum number of robots or axes and also offer few expansion options, according to Wuyun Xiao. Achieving an efficient data exchange with other devices and system control can be quite difficult. With TwinCAT automation software, on the other hand, users are able to build a high-performing system of Delta robots. A single controller can govern multiple robots, and the broad portfolio of EtherCAT I/O terminals simplifies the integration of robots and the packaging line considerably.

Wuyun Xiao explains: “We employed the robotics algorithms in the corresponding TwinCAT library from very early on and even developed our own algorithms based on TwinCAT. PC-based control technology from Beckhoff is not only flexible and easy-to-use when programming even complex algorithms. It also features rich cam instructions that meet the general requirements for the products processed with our packaging lines. In addition, you can easily integrate third-party software into the Windows environment, including our new algorithms, and the real-time-capable and very fast PC-based control technology from Beckhoff makes it ideal for implementing even complex motion control tasks. The use of the AX5000 Servo Drives and AM8000 servomotors in addition to the CX2040 Embedded PC and TwinCAT contributes to these capabilities.”

On the software side, the flexibility of TwinCAT provides ample capabilities for individual customization, says Wuyun Xiao. For example, the Delta robots’ positions are not controlled via an NC program as usual, but directly via TwinCAT PLC. “In this solution, Triowin employs its own robot algorithms and path planning function blocks without the need for additional robotics software such as NC I or other interpolation functions. That’s why a single CX2040 can control five 2D Delta robots and four 4D Delta robots, which keeps hardware costs down,” adds Wuyun Xiao.

More efficiency in production and engineering

TwinCAT can be used to implement common control tasks as well as other applications beyond that, such as big data, machine vision for pattern recognition, condition monitoring, and power monitoring. For Wuyun Xiao, these are highly useful tools for implementing sustainable improvements in production and engineering. For him, the corresponding TwinCAT libraries are the most efficient way to analyze and support the communication between controllers and cloud-based services. Synchronized with machine cycles, TwinCAT Analytics stores acquired process data locally, on a server, or in the cloud. All measured values are recorded and provide a database for comprehensive analyses as part of add-on services such as predictive maintenance. All this information is extremely helpful for minimizing costly downtime, says the project manager.

Wuyun Xiao appreciates not only the hardware and software products from Beckhoff, but also the company’s comprehensive support services: “The engineering support and training as well as the fast technical assistance worldwide with regard to implementing products in specific applications are extremely important to us. The same applies to the planning and commissioning of complex automation systems.” Summing up the technical aspects, he adds: “The openness of the system and the performance of their automation products are especially useful in our collaboration with Beckhoff, because they enable us to improve the performance of our systems. The Beckhoff philosophy of state-of-the-art technology and great openness also helps us optimize our planning.”

Wuyun Xiao’s conclusion is: “Triowin will continue to focus its activities on developing intelligent production means and especially systems for the food and pharmaceutical sectors as well as building smart, digital factories. We hope to continue on this path together with Beckhoff and receive further support for hardware and software products.” For example, Triowin plans to ensure the safety of its robots with TwinSAFE in order to eliminate the need for separate robotics and safety controls and to streamline the engineering processes and minimize the total costs.