



PC-based control solution powers blister packaging machine for the pharmaceutical industry

## PC Control for fast, error-free and compact pill packaging

Switzerland's Rohrer AG exclusively employs PC-based control systems from Beckhoff in its new R760 blister packaging machine, which was designed especially for the pharmaceutical industry. By leveraging the powerful and highly accurate EtherCAT I/O system and the dynamic and compact drive components from Beckhoff, Rohrer was able to develop a machine that operates not only in a fast and error-free manner, but takes up very little space.

Rohrer AG specializes in machines for developing and configuring flexible films and foils and the products made from them. To produce its customized tools and machines, the company works closely with its customers from the initial idea to the final realization. Its support services range from developing samples, to building prototypes, to configuring the production equipment.

### **Modular blister packaging machine**

The customizable R760 machine is used to produce packaging for small to medium lot sizes. It can be used for all stages ranging from the development to the mass production of blister packs from flexible film. The machine handles the entire manufacturing process, meaning it can thermoform, seal, perforate

The R760 machine covers the entire manufacturing process, i.e. it can thermoform, seal, perforate and stamp blister packs.

The powerful PC-based control technology from Beckhoff allowed Rohrer to achieve an output rating of 40 double blister packs per minute for the first time with its R760 machine.

The new R760 blister packaging machine from Rohrer serves as a development platform for the packaging of so-called orally disintegrating tablets (ODTs).



and stamp blister packs. Camera systems inspect the packs to ensure that they are properly filled and automatically discharge any rejects. If space is tight, the number of machine modules can be reduced. And thanks to its GMP-conforming design (good manufacturing practice), it is even suitable for installation in cleanrooms.

The R760 blister packaging machine can process aluminum foil and plastic film for pharmaceutical, cosmetics and healthcare applications. The project being covered here involves a machine used by a large packaging service provider for the pharmaceutical industry. The machine is used to evaluate new products and packaging types. The pills being packaged in this case are so-called orally disintegrating tablets (ODTs), which are freeze-dried with the patented Lyopan process and can be taken without water. The machine's design and automation

technology had to meet extra-high requirements in terms of speed and size. The result was the first system featuring 40 cycles, i.e. an output capacity of 40 double blister packs per minute.

#### All control technology is PC-based

Rohrer gained its first experience with PC-based control technology from Beckhoff as early as 2008, when the company installed integrated CP6200 Panel PCs and cabinet-mounted C6920 Industrial PCs (IPCs) for the first time. In 2012, Rohrer decided to switch completely to PC Control. Bernd Esch, controls manager in Rohrer's Processing & Packaging unit, explains the reasons: "The previous control architecture had a few disadvantages. For example, it required multiple bus systems. Ensuring that the safety technology met the performance level required by the EN ISO 13849

As the all-encompassing control solution for the R760, PC Control handles all the safety functionalities and the Ethernet communication.



standard was also quite complex. In addition, customers demanded more compact systems – something we would not have been able to provide with the relatively large drives at the time and the additionally required EMC filters. The AX5000 drives from Beckhoff, on the other hand, are very compact and include integrated EMC filters. They reduced the cabinet space by roughly 30 percent.”

In addition, the CP6200 display Panel PCs and the C6920 IPCs already provided sufficient computing power for the automation tasks. Bernd Esch continues: “The TwinCAT automation software offered not only the required PLC functionality, but also a powerful software-based NC system. This meant that we did not need an extra controller besides the space-saving IPC from Beckhoff. I should also mention that Beckhoff Switzerland provided us with very good local application support for the PC Control solution.”

Another significant advantage, says Esch, is the openness of PC Control: “We must be able to connect our machine controllers to any network. The broad spectrum of EtherCAT Bus Couplers and fieldbus terminals gives us complete flexibility in this regard. We can also communicate easily with the IT system, because with the integrated Ethernet interface and the TwinCAT ADS layer we can call up any control data we need without having to make a change in the PLC program.” Connecting the visualization system was just as easy, because – like most systems on the market – it already had a driver for TwinCAT. The communication with Java-based programs for the web visualization and with a MySQL database for things like batch parameters and error messages also works extremely well, says Esch.

At the core of the PC Control solution for the R760 machine is the C6920 control cabinet IPC with its 1.9-GHz Intel® Celeron® processor, multilingual Windows

XP Professional operating system and TwinCAT NC PTP. The operator controls the machine via an arm-mounted CP7902 Control Panel that features a 15-inch touchscreen, customized screen film and a customized keyboard extension. The motion control functions are performed by eight servo drives of types AX5112, AX5140 and AX5206, including an AX5805 TwinSAFE card, and 10 servo motors from the AM8000 series. The roughly 150 I/O data points are collected by approximately 100 EtherCAT analog/digital and TwinSAFE terminals and are integrated into the control technology via four EK1100 EtherCAT Couplers.

#### Highly dynamic drives require minimum installation effort

Besides being very compact, the servo drive technology from Beckhoff features outstanding dynamic characteristics, says Bernd Esch: “By adjusting the production parameters accordingly, we were able to quickly achieve the exceptionally high output of 40 double blister packs per minute. We did this without reaching the limits of the machine’s servo drive technology.” Rohrer achieved this level of performance with the help of AM8000 high-performance motors, which are characterized by their low rotor inertia and up to five-fold overload capacity. They drive three servo axes for opening and closing the presses, two axes for the foil transport, one axis for feeding and positioning the trays into the machine, two axes for handling the blister output, as well as adjustment axes that move the processing stations into their proper position relative to the product.

Rohrer also benefitted substantially from the One Cable Technology (OCT) made by Beckhoff, which combines the power supply and the feedback system into a single motor cable. The single-cable solution transmits the information reliably and protected from interference via a digital interface. This eliminates the need for wires and connectors on the motor and controller sides, which in turn produces significant component and commissioning savings. Bernd Esch realized this

With the customized design of the CP7902 Control Panel, Bernd Esch, Controls Manager of Rohrer AG's Processing & Packaging Technology unit was able to optimally implement his requirements.

Through the use of Beckhoff drive technology with one-cable technology (OCT), Rohrer was able to design an uncluttered control cabinet and reduce its installation and material costs by approximately 25 percent.



as well: "With its reduced cabling requirements, OCT delivered huge savings for us, particularly since two drives employ power track chains. It enabled us to make everything a little smaller, which also helps with the overall machine design. All in all, OCT reduced our installation and material costs by roughly 25 percent. It also makes the commissioning process a lot easier. In the past, running a completely new encoder line was the standard solution when malfunctions occurred. Now that they are integrated into the motor cable, we no longer have to engage in long discussions about rerouting the wiring."

#### **Integrated safety technology provides new options**

Other features that simplified the engineering of the machine are the automation system's integrated safety functions, ranging from the TwinCAT Safety Editor to the Safety over EtherCAT communication protocol to the TwinSAFE terminals and the AX5805 TwinSAFE drive option card. They allowed Bernd Esch to design the safety functionalities with much more flexibility: "We can design the safety system with much more openness. For example, each safety door now has its own TwinSAFE terminal, which eliminates the previously common serial connection of safety switches or emergency stops."

The flexibility of the TwinSAFE system also simplifies the selective execution of safety functions for individual machine modules. For example, certain machine components can remain "live" when the machine starts up, while others are safely shut off when a safety door is open. Bernd Esch: "Implementing something like this was extremely difficult in the past and only possible with enormous amounts of wiring. With TwinSAFE we can handle this with a much more elegant and compact solution that also requires fewer components and costs less."

#### **Speedy and highly deterministic control technology delivers precision**

The foil used to seal the trays and the trays themselves have fiducials (visual reference points) which are read as they move through the machine. Depending on the relative position of the tray, the machine reads the exact end position in the conveyor system and computes the relative position of the processing units. Through the use of fast EtherCAT communication components, Rohrer was able to move the products at the high speed of approximately 250 mm (10 inches) per second and even double it with Beckhoff eXtreme Fast Control (XFC) technology. Bernd Esch: "With the XFC terminals and the matching sensors, we achieve speeds of up to 500 millimeters (20 inches) per second. Despite this enormous speed, the system detects the fiducials reliably and performs its calculations and closed-loop control operations accurately. XFC is also a very interesting feature for us because it can be used to let the moving products trigger the inspection cameras with exceptional accuracy."

Further Information:

[www.rohrerag.com](http://www.rohrerag.com)

[www.beckhoff.ch](http://www.beckhoff.ch)