

Canadian plastics industry leader, Husky Injection Molding Systems perfectly balances efficiency, quality and costs

## High-precision control technology lowers consumption of raw materials in injection molding machines



Whether you prefer soda, water, tea or fruit juice, you can safely assume that the plastic bottle containing your drink started its life as a so-called 'preform'. The preforms for PET bottles are produced using an injection molding process and look like a plastic test tube with a threaded neck for the bottle cap. In the second step, they are loaded into a blow molding machine, where they are stretched and inflated to form the finished bottle. An enormous share of the global market for PET plastic bottles is based on preforms manufactured using machines built by the Canadian plastics industry innovator, Husky Injection Molding Systems Ltd.



Husky is a leading global manufacturer of injection molding machines and a provider of services to the plastics industry. The company, which is headquartered in Bolton, Ontario, has manufacturing facilities in Canada, the United States, China, Luxembourg, Austria, Switzerland, and the Czech Republic. A robust service and sales network comprising more than 40 branch offices supports customers in more than 100 countries. An extensive machine portfolio enables the manufacturing of a wide range of plastic products from bottles and bottle caps to components for medical technology.

#### **A long history of PC-based machine control**

Husky has been one of the world's leading users of PC-based control technology from Beckhoff since the late 1990s, with several thousands of systems in the field. "We have built one generation of PC control system after another, and in over 15 years of continuity, a reliable cooperation has been established between Husky and Beckhoff," says Electrical Design Team Leader, Endel Mell. Beyond that, Husky has developed a comprehensive spare part and retrofit program, ENCORE™, which helps customers with older Husky machine generations upgrade to modern PC-based control without having to purchase a new machine.

A major trend in the injection molding industry is the reduction of raw materials used, while at the same time ensuring top product quality, i.e. excellent mechanical performance characteristics of the end product and low unit costs. "These requirements can only be implemented through high-precision process control on the basis of innovative automation technology. Husky remains at the forefront of the industry through best-in-class system design," says Director of Development Engineering, Roman Pirog. "We design the system and the automation around the product and, in doing so, create specialized solutions. This ensures the best possible throughput as well as efficiency in materials use and parts quality."

Husky has implemented this concept with its new machine generation for the production of PET preforms. Customer suggestions were incorporated into the development, according to Paul Commisso, Global Marketing and Communications Manager at Husky: "The HyPET® HPP5 successfully builds on the proven technology of the long-running HyPET® platform. By equipping it with additional functionalities, the end user can reduce total production costs and at the same time ensure top quality of the preforms."

#### Modern multi-core Industrial PCs boost injection performance

With its strategic new developments, Husky is purposefully catering to their customers by anticipating the needs of the market. In the HyPET® HPP5, the company presents a system aimed at supporting its customers in the realization of even more competitive injection molding processes. "Recently, we began using multi-core Industrial PCs (IPCs) to bundle the new software functionality we added to the HyPET® HPP5 while maintaining ever-faster scan times in our control platform," explains Teodor Tarita-Nistor, Control Software Team Leader. The central control platform of the HyPET® HPP5 is a C6930 Industrial

PC (IPC) with Intel® Core™ i7 quad core processor, equipped with TwinCAT NC PTP automation software. It drives the complete system, including PLC, motion control, measurement technology, communication to auxiliary devices, and all HMI functions.

In order to maintain the company's market position as a leading technology supplier, Husky takes great care to protect the intellectual property (IP) of their machinery, especially in all areas of software. Using TwinCAT software, Husky has created a wide range of their own software libraries for Motion Control and hydraulic control. "In the HyPET® HPP5, we run the PLC tasks on one processor core, while another core is reserved for the HMI software," explains Teodor Tarita-Nistor. "This helps us decrease the sampling times of the I/O signals while at the same time optimizing the overall control quality of our production processes. The real-time control capability and repeatability of each motion axis are crucial for the quality of the end product."

#### Customized Control Panels provide unique machine appearance

The innovations found within the HyPET® HPP5 also include the new POLARIS™ operator interface. Using a customized 19" CP3919 Control Panel from Beckhoff, the interface has a look that is unique to the HPP5. This ensures clear differentiation not only on the overall marketplace, but also within Husky's extensive portfolio of machines. "During the development of the HyPET® HPP5, Husky decided to use a larger display format. The CP3919 perfectly fit the bill with its 19" TFT screen and brilliant resolution of 1280 x 1024," says Roman Pirog. "In addition to the color scheme and the logo on the POLARIS™ panel, we cooperated very closely with Beckhoff in the panel layout. The result is that we now have an injection molding-focused button layout with outstanding ergonomics."



The Husky HyPET® HPP5 successfully builds on the proven technology of the HyPET® platform, which has had a long-term presence on the market. Adding further functionality enables end users to lower their total cost of manufacturing while ensuring optimum preform quality.

An enormous share of the world market for PET plastic bottle preforms is manufactured on injection molding machines from Husky Injection Molding Systems.



The software engineering team at Husky completely redeveloped the POLARIS™ HMI programming in order to further increase the effectiveness of the machines and to improve user-friendliness. Husky created the HMI software using C# as the programming language and enriched it with customized injection molding features that go beyond conventional HMI software platforms. The logic of the POLARIS™ was designed so that peripheral devices such as temperature controllers can be monitored and operated. The system software and menu screens were also revised for a simplified machine start-up. Logic was added that reacts to signals from auxiliary devices and alarms during service operation. The HMI can also provide specific instructions how to rectify, for example, the misalignment of a mold without the help of a crane, which improves uptime significantly.

#### **EtherCAT added to Husky's winning formula**

Husky not only uses modern PC-based control systems; since 2006 it has also employed EtherCAT, the industrial Ethernet communication system developed by Beckhoff. "With EtherCAT and TwinCAT software working together, there is a wide range of diagnostic tools at Husky's disposal to pinpoint any problems with equipment or the end product. Naturally, this is a major benefit that maximizes uptime," says Endel Mell.

For the I/O system, Husky has integrated a wide range of EtherCAT solutions from Beckhoff. "Through EtherCAT, Husky has achieved a better unification of our communication system while reducing I/O wiring and troubleshooting efforts," Tarita-Nistor states. Husky uses EtherCAT High Density (HD) terminals, which offer a maximum of 16 digital inputs or outputs, or a mixture of the two, in a 12 mm terminal housing. "We are constantly adding functions to the machine and this requires new I/O modules," explains Endel Mell. "However, our



## At a glance

### **Solutions for the plastic industry**

High-precision process control in the production of preforms

### **Customer benefits**

Use of raw materials reduced, while at the same time ensuring top product quality

### **PC-based control with EtherCAT**

- C6930 Industrial PC with Intel® Core™ i7 quad-core processor
- TwinCAT NC PTP
- Customized POLARIS™ user interface, using a CP3919 Control Panel with 19-inch screen
- EtherCAT industrial Ethernet system and I/O components



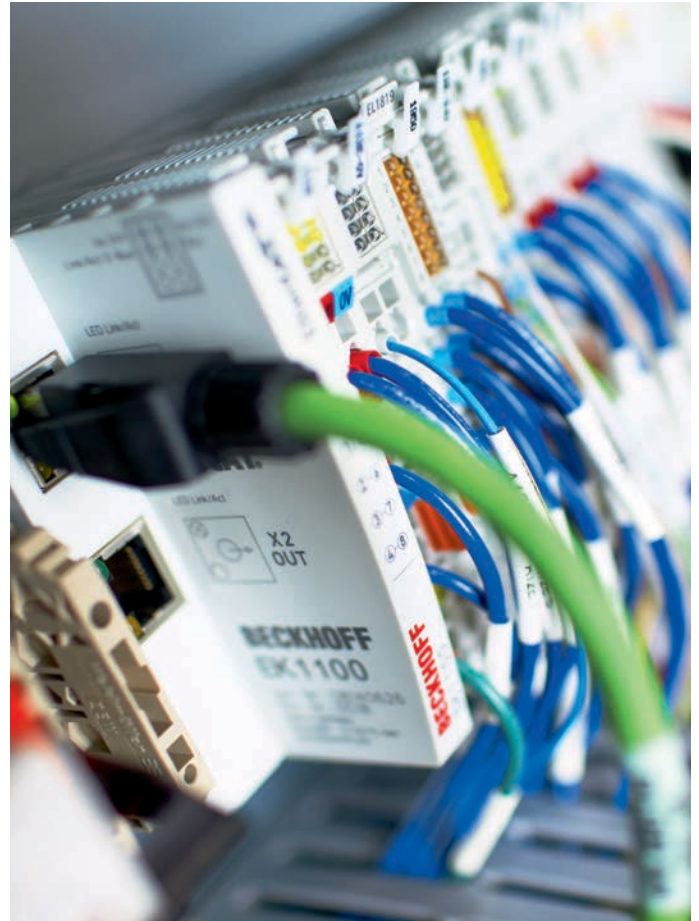


As a centralized multi-tasking controller, the C6930 Industrial PC drives the entire HyPET® HPP5 system, including PLC, motion control, measurement technology, communication to auxiliary devices, and all HMI functions.

machine footprint can't get any bigger, so we benefit from HD Terminals. We can fit many more I/O points in the same or smaller space."

Apart from a wide range of IP 20-rated I/O solutions, Husky has also implemented EtherCAT Box modules in IP 67 protection for machine-mountable I/O that can withstand harsh plant environments outside of control cabinets. In addition, the Beckhoff FM3312-B110 thermocouple fieldbus modules with EtherCAT interface on Husky machines can each be connected to 12 or 32 thermocouples. The connecting circuitry for these thermocouples is accommodated in a robust, splash-proof industrial plug housing. This enables the fast and simple connection and disconnection of the thermocouples.

The modular EtherCAT Terminal system also allows Husky to implement advanced I/O functions. The EL3413 three-phase power measurement terminal, for example, is used in the HyPET® HPP5, allowing voltage measurements up to 690 V. It tracks the current consumption of the machine and supplies feedback on energy use while providing detailed data for statistical analysis. "Instead of using a separate, stand-alone measuring instrument, the EL3413 is fully integrated into the standard EtherCAT I/O system," says Teodor Tarita-Nistor, describing the advantages of this solution. "A dedicated energy measurement solution would be more limited in terms of connectivity; it would make system



The modular EtherCAT Terminal system also allows Husky to implement advanced I/O functions such as energy measurement.

architectures more complicated and require varying, highly specialized software platforms."

Husky generates further increases in performance from the use of EtherCAT-based eXtreme Fast Control (XFC) technology from Beckhoff. "The EL3702 and EL4732 XFC terminals with oversampling functions help us minimize control loop delays, maximize cycle time speeds, and increase the accuracy of our controls," explains Teodor Tarita-Nistor. Through the use of the XFC terminals, the signals are oversampled with an adjustable integer multiple of the bus cycle time. The base time of the terminal can be synchronized precisely with other EtherCAT devices via distributed clocks. The XFC terminals can output a maximum of 100,000 values, i.e. 100,000 samples per channel per second.

### **Husky extends its lead**

The HyPET® HPP5 project was completed at the end of 2013, and the positive results can be expressed in compelling figures: "Considering all aspects of the system design, the new machine generation provides productivity and cycle time gains between 3 % and 12 %, based on the application," Roman Pirog reports. One of the top results Husky has generated using EtherCAT is a new level of processing speed. "We can now run our processes at 500  $\mu$ s, which was not



With the new POLARIS™ HMI, which is based on a custom CP3919 19-inch Control Panel, the HyPET® HPP5 has a look that is unique to the HPP5, ensuring clear differentiation in the marketplace and within Husky's extensive portfolio of machines.

possible with other fieldbuses in our application," explains Tarita-Nistor. He goes on: "We can even achieve performance of 100  $\mu$ s in one project that is presently in the development phase at Husky."

The increased system accuracy and improved reaction times of the control solution ensure exact repeatability in the HyPET® HPP5, i.e., the customer can precisely target an optimized weight when manufacturing preforms. This allows the customer to minimize the use of raw materials without risking the production of non-compliant parts. The EtherCAT-equipped injection molding systems from Husky can maintain performance within the range of Six Sigma and ensure industry-leading part precision and quality. Through its innovative injection molding systems, Husky enables its customers to save hundreds of thousands of dollars on raw materials and operating costs per machine per year. "In order to maintain this leading position in our industry, Husky will continue to integrate the latest automation technologies into our machines in order to improve the competitiveness and profitability of our customers," says Roman Pirog.

Further information:

[www.husky.co](http://www.husky.co)

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