

All- Electric



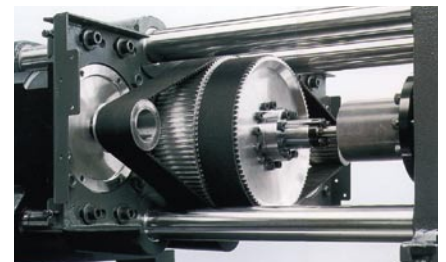
Nearly maintenance-free due to the use of electromechanical drives, the ELEKTRA Evolution series from Ferromatik Milacron is penetrating price and performance categories that used to be reserved for hydraulic injection molding machines. This was only made possible by using cutting edge technology. ETHERNET Powerlink has also made a major contribution to the success of this new machine concept.

Whether toothbrush, telephone receiver, or shower head, we are surrounded by a large number of injection molded objects in our daily lives. Simply put, a typical injection molding machine consists of an extruder for plasticizing the granulate, a clamp to open and close the mold, an injection unit to inject the plastic into the mold and an ejector to remove the cooled work piece from the mold. Products manufactured on these machines can typically have cycle times of 8 seconds. However, there are already machines in production with cycle times of less than 4 seconds.

The world market shows a clear trend away from hydraulic machines to all-electric machines. The absence of large amounts of oil and the therefore decreased risk of fire hazard, as well as reduced noise and energy consumption are making all-electric machines also much more interesting for all other users.

"In Japan, many production areas are now being built on upper floors of buildings. Due to earthquakes common in this region and the resulting fire hazards, only all-electric machines are typically purchased."

Complex processes can generally be better controlled electrically than hydraulically. Electrical control loops have a large bandwidth whereas in hydraulic drives, large volumes of oil have to be moved through long hoses which limits the dynamic properties. Previously, all-electric machines were always positioned at the upper end of the price scale. With the ELEKTRA Evolution line, a new trail is being blazed, and an all-electric machine is being offered in the price/performance class of classic hydraulic solutions. Important criteria in this regard are the mold installation area, ejector force, shot weight during injection and the aggregate system force. Many of these parameters have been difficult to handle using all-electric machines from worldwide leading competitors in Japan. To achieve this goal, Ferromatik Milacron has used a specification designed accordingly and the most modern development and production technologies from the very start. The result is a highly optimized all-electric injection molding machine.



"An injection molding machine does not necessarily seem very dynamic at first glance. But if you consider parameters such as a mold closing speed of 1,000 mm/s and the positioning precision required for such an application, you will quickly find out that success depends on highly dynamic drive control."

Other machine parts, such as the extruder, ejector, and injector also place high demands on the drive and control system in the areas of power, speed, and precision. For a precise production cycle, drives must be coupled together. Because of the precision required, this is only possible with a high-speed bus system unless you want to deal with the enormous effort of discrete coupling. "In principle, we are CAN bus fans, but we know exactly where its limits are," says Dr. Kalis. "With a theoretical transfer rate of 1 MBit/s and the necessary synchronization of three to four axes in a 2 ms cycle, we quickly ran into unacceptable dead times. Profibus/DP and Sercos were not an alternative either



Dr. Horst Kalis,
Head of development
and construction.

Ferromatik Milacron Maschinenbau GmbH is a subsidiary of the Milacron company in America and offers a complete line of machines with shot forces from 300 to 30,000 kN. The company was founded in the mid-1950s and now has around 500 employees at the headquarters in Malterdingen, Germany working on the development, production, and marketing of extremely modern injection molding machines. Ferromatik machines are synonymous with high-tech in the area of injection molding – whether you are talking about multi-component technology, high-performance and intelligent machines for the fastest cycles and thin-wall applications, double-plate technology, or all-electric injection molding machines. In the latter area, Ferromatik Milacron is a worldwide leader for this technology and the market leader in Europe. Detailed information concerning the entire product range of standard machines and examples of special machines can be found at www.ferromatik.com

because of the costs. We were very happy to find out about ETHERNET Powerlink at just the right time.

We have had a very good relationship with B&R for many years,” continues Dr. Kalis. “Naturally we researched all channels, but in the end B&R and ETHERNET Powerlink seemed to be the ideal solution for the Evolution product line that was currently developed at that time. We are still very satisfied with the decision and I consider ETHERNET Powerlink, in general, qualified to control all of our axes.” Ferromatik was faced with the decision to use the brand-new technology as a pilot customer. The high-speed 100 MBit/s bandwidth, the deterministic data transfer so important for drive coupling, and the simple cabling were decisive factors.

“A great deal of injection molding know-how is present in the positioning control loops used for the ELEKTRA Evolution series. The all-electric solution allowed us to evaluate the motor torque of the drive directly via ETHERNET Powerlink and incorporate it into the controller strategy.”

Dr. Kalis says that the demands on quality are also increasing enormously. “An airbag manufacturer requires that information for each shot is recorded. In this regard, the universal capabilities of the Powerlink system guarantee maximum flexibility and transparent access of all levels. With ETHERNET Powerlink, we are already prepared to link everything up to the drive level.”

In America, the Ferromatik Milacron group will also use B&R controllers for their machines in the future. In the first half of the year, Ferromatik has already delivered 50 ELEKTRA Evolution series machines, and the amounts planned are very promising. “The machines have been running without interruption, and smaller problems were purely user-specific in nature,” says Dr. Kalis happily now that the concept of the Evolution series has proven itself.

“For me, ETHERNET Powerlink is the ideal vehicle for an injection molding machine,” concludes Dr. Kalis. “It allows many devices to be operated at very high speeds on a single line. For this reason, we are following the standardization process for the ETHERNET Powerlink initiative with great interest!”

