Fast Injection Guaranteed

Highly dynamic injection with a combination drive
Contents

Editorial

Injection Molding

4 Fast Injection Guaranteed
ARBURG GmbH + Co KG, Germany

6 Enter the Eco-Production Age
Billion S.A.S., France

8 Award-Winning Innovation
Chuan Lih Fa Machinery Works Co. Ltd., Taiwan

9 The Right Drive for Injection Molding
LS Mtron, Korea

10 Direct Success
KraussMaffei Technologies GmbH, Germany

Extrusion

11 A Complete Control Package
Macro Engineering & Technology Inc., Canada

12 More Layers, Less Resin
Macchi S.p.A., Italy

14 One System, Many Options
Leistritz Extrusionstechnik GmbH, Germany

16 (R)Evolution in Extrusion
High Tech Extrusion, Austria

18 Consistent Quality
ER-WE-PA GmbH, Germany

Thermoforming

20 Pushing the Limit
Geiss AG, Germany

Handling

22 Exceptional Automation
GeKu Automatisierungssysteme GmbH, Germany

Retrofit

24 Savings through Retrofitting
BSH Bosch und Siemens Hausgeräte GmbH, Germany

25 Back on Top Form with New Standards
Franz Schneider GmbH & Co. KG, Germany

26 Perfect (Retro)Fit
Electrolux Group, Italy

28 A Trade Fair Visit with Results
Mangfall Plastik GmbH, Germany

Service

30 Greater Energy Efficiency for Machines
Saving energy with the Application Center in Cologne

spectrum PLASTICS 2010

Page 22

Handling made by GeKu: From machine to high-performance production plant

Page 6

Fully electric injection molding machines achieve significant energy savings

Page 12

Siemens Torque motors help ensure process quality in coextrusion plants

Page 22

W. Geyer

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Page 22

Handling made by GeKu: From machine to high-performance production plant

Page 22

W. Geyer
Dear readers,

In the plastics industry, ever higher demands are placed on the end-products. Example of this include the need for foils that are particularly thin, but extremely resistant to tearing, or the need for coatings with water-repellent properties. For the manufacture of these high-tech products, a highly dynamic, innovative drive and automation technology is essential. At the K 2010 trade fair in Düsseldorf, we will exhibit end-to-end branch solutions for the plastics industry at Hall 10/Stand 40.

As a trade fair highlight, we will be introducing a new highly dynamic combination motor. The mechatronics unit, consisting of rotary and linear drives, was specially designed for the customer-specific requirements. Another focus is our highly-efficient servo pump for hydraulic injection molding machines. It increases the machine output with simultaneous energy savings thanks to electrical instead of hydraulic drives. As a “first-class solution” for fully electric injection molding machines, the Sinumerik Injection Molding Electric allows us to offer equipment that ensures the highest quality of parts and reproducible processes. New for the extruders is the innovative software module TCP 3000, which enables optimal and cost-efficient temperature regulation.

At K 2010, we are also exhibiting our proven drive and automation solutions for a variety of applications relating to plastics technology, solutions that can be quickly adjusted to all customer-specific applications. Our portfolio is rounded out by the coordinated service offerings of our application centers, which provide you with active, worldwide support from the conception to the development of optimized solutions.

See for yourself what services we offer, and let yourself be inspired by the comprehensive solutions for the plastics industry contained in this edition.

Klaus Recker
Head of Business Development for Plastics & Rubber Machines
Motion Control Systems
ARBURG GmbH + Co KG, Germany

Fast Injection Guaranteed

The brand-new injection unit for electrically driven injection molding machines made by ARBURG incorporates a Siemens combination drive for fast, highly dynamic injection.

ARBURG GmbH + Co KG is one of the world’s leading manufacturers of injection molding machinery with clamping forces of 125 to 5,000 kN. In addition to hydraulic, hybrid, and electrically driven ALLROUNDER injection molding machines, the portfolio of the family-owned company also includes robot systems, complex manufacturing cells, and additional peripherals. Key factors in the ARBURG success story are the central production at the parent plant in Loßburg, the high-quality and modular design of ARBURG products, and the company’s ability to innovate.

Consolidated expertise

This innovation is also reflected in joint developments with Siemens. The overall aim to manufacture a mechatronic injection unit for electrically driven injection molding machines was achieved thanks to a brand-new combination drive from Siemens that combines the linear motor for the injection axis with the rotation motor for the metering axis. “We use the new combination drive on a 370 A size electrically driven injection molding machine, which operates for this purpose with an 18-mm screw,” explains Eberhard Duffner, development manager at ARBURG. The ALLROUNDER 370 A is one of the smaller electrically driven injection molding machines, but the combination drive can also be used on the larger A-series ALLROUNDER machines.

“Both Siemens and ARBURG had been playing with the idea of using such a drive for the injection axis in electrically driven machines for a long time. By consolidating the expertise of the two companies, their shared vision was finally able to become a reality,” says Duffner enthusiastically. In a first step,
Siemens provided a prototype, which was gradually refined in accordance with ARBURG specifications. Thus, within the framework of the project, the motor concept and mechanical machine interface were designed in addition to the required load specifications for the injection molding process.

In the combination drive, the linear and rotation motors are combined in a single enclosure. Thanks to the direct drives, only a few mechanical components are required for the unit, thereby minimizing wear and maintenance costs. The same applies to the linear motor itself, which has very few moving parts, making it wear-free.

The highlight of the new injection technology principle is the linear motor, which offers distinct advantages. The high acceleration capacity is linked to the direct connection of the linear injection motor with the screw and the low inertia ratio. As a result, it is possible to reach very high speeds while maintaining full control of the motor. In addition, the drive has absolutely no play, thereby guaranteeing maximum precision and reproducibility. The positioning is accurate to less than 0.01 mm.

**Completely new possibilities**

“Thanks to the excellent acceleration capacity and the high injection speeds, it is possible to manufacture more than just very thin-wall parts. This new injection technology principle also opens up completely new areas in the thin-wall sector that have not been feasible until now,” adds the ARBURG development manager with an eye to the future. As a result of the increasing miniaturization of components, Duffner has identified sectors such as the electrical and electronic field where storage enclosures and plugs have development potential. Materials manufacturers will also play an important role in future applications in the thin-wall sector, as the plastics used must meet high specifications with respect to their flow properties. The new drive concept and the resulting application possibilities will therefore certainly impact developments in the materials sector.

After extensive trials, the design phase was completed and the machine was then tested with existing thin-wall tools under real-world conditions. It was first presented to international trade experts at K 2010. Duffner sees a bright future ahead, stating that “ARBURG would like to open up new application areas for this unique technology with customers and partners from the materials sector, for example.”
Energy prices are on the rise and will continue to do so. As a result, the plastic manufacturing industry has set itself the task of finding solutions that reduce energy consumption. This industry operates giant pieces of machinery, and the amount of energy these machines consume will make economical production more difficult in years to come. One company that has decided to take on these challenges in good time is the French mechanical engineering concern Billion S.A.S., based in Bellignat, France.

Energy prices reduced by up to 70 percent
Billion S.A.S. has been manufacturing injection molding machines since 1949 and is renowned for its expertise in the field of dual-component injection molding. In order to minimize energy consumption during production, the company began developing hybrid machines a few years ago. With the SELECT series, Billion is now offering fully electric injection molding machines that provide exceptional levels of energy efficiency. The SELECT series now comprises a range of energy-saving single- and multiple-component versions, with a clamping force of 50 to 400 tons.

“We have long since met the objective we set in 2007 to reduce energy consumption by 30 to 50 percent,” explains Daniel Bejannin, who is responsible for software and special research projects at Billion. “We are now aiming to reduce this by up to 70 percent, perhaps even more for some applications.”

In addition to reducing energy consumption, the SELECT series machines provide a high degree of precision and unique motion repetition accuracy – a great advantage for the pharmaceutical, medical, and cosmetics industries in particular.

Siemens as the ideal partner
To ensure rapid implementation of the product design phase, the French engineering company selected Siemens as a reliable project partner. According to Billion S.A.S., Siemens was able to offer not only outstanding products but also an exceptional commitment to developing the solution. Additional factors were the easy availability of replacement parts and the support and customer service departments. As a result, Billion S.A.S. had a dedicated and committed team on-site providing support in French.

The SELECT series is currently equipped with synchronous servomotors and high-torque motors from Siemens. As a result of the special machine design, the motor is located directly on the ball thread,
allowing for direct power transmission without drive pulleys or belts.

According to Bejannin, working closely with Siemens during machine development was a sensible move and one that proved very important: “The design phase was based on an intensive analysis of customer requirements from different areas of application. As a result, we were able to define a requirement profile for each function early on, tailored to the user’s specific needs. The drives and motors were then designed and dimensioned according to this profile.”

**Efficient and environmentally friendly**

The SELECT series is equipped with air-cooled synchronous motors. “We wanted to build machines that were as environmentally friendly as possible, while avoiding water-cooled solutions. Such solutions would need a separate, closed circuit and, more importantly, would require maintenance,” explains Bejannin.

With the new drive system, the torque and speed of the motors can be modified for each individual machine motion. “The synchronous motors with power transducers enable the operator to control both the speed the injection unit moves and the contact force of the nozzles with extreme precision. Manual settings, common with hydraulic machinery, are no longer required,” asserts Bejannin.

**The synchronous motor is one of the components that help enable a high productivity**

**Extremely energy-efficient: the fully electric dual-component version of the SELECT injection molding machine from Billion**

**An elegant dual-component dispenser for tablets: this is one example for eco-friendly and clean production with the fully electric SELECT machine series (Production: CMSI_TEXEN; Design: CGL Pack)**
Taiwanese machine manufacturer Chuan Lih Fa Machinery Works (CLF) has been manufacturing injection molding machines since 1966, with steadily growing success. In order to remain competitive in the world market, CLF was looking for a complete solution for its AE series of fully electric injection molding machines. It found a perfectly aligned automation solution in the Siemens IMe 5000. At the heart of the IMe 5000 are the Simotion D435/445 drive-based motion control system and the Sinamics S120 drive system. Communication is facilitated by Drive-CLiQ. Integrating Siemens 1FT6 and 1FK7 standard motors into the solution further improved the functionality of the machines so they perfectly matched CLF’s requirements. In March 2010, 230- and 450-ton injection molding machines with the new Siemens automation technology were unveiled at the Taipei PLAS plastics technology trade fair in Taiwan. The machines were awarded the fair’s first prize for innovation.

Reduced costs and processing times
CLF’s AE series of fully electric injection molding machines are particularly suited to the manufacture of optical glass and components such as thin-wall light guide plates (LGPs). The new IMe 5000 automation solution allows low- and high-speed injection molding, which means that the specific requirements for optical components can be more than adequately met. The two-motor synchronization means that the injection unit can reach a maximum injection speed of 600 mm/s. The simultaneous multiaxis control drastically reduces processing times, and therefore also the manufacturing costs, for thin-wall production. What’s more, energy consumption can be reduced by over 15 percent thanks to energy recovery in the drive system. Combined, these benefits have noticeably increased the CLF machines’ competitiveness.

A customized automation solution improves both the functionality and the competitiveness of injection molding machines from Taiwan.

The two-motor synchronization means that the injection unit can reach a maximum injection speed of 600 millimeters per second

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The Right Drive for Injection Molding

The new LGE2000HB injection molding machine sets standards in terms of speed, cycle time, accuracy, and energy savings thanks to an advanced drive solution.

LS Mtron, the largest Korean injection machine maker and a global corporation in the field of injection molding systems, has developed a large electric injection molding machine (LGE2000HB) together with Siemens, in a collaboration that began in 2009. The clamping force is 2,000 t, and the main driving mechanisms – with the exception of clamping force generation and the movement of the split tie-bar nut and carriage – are implemented by servo-motors.

Strategic product

The LGE-2000HB was designed as a strategic product that targets high-end molding in the field of electronics, optics, automobiles, and general industrial goods. In addition to the features of a conventional all-electric molding machine, it also includes mechanisms and control functions that facilitate injection-compression molding and chemical foam molding. Unlike most all-electric injection molding machines, whose clamping force is generated through a link mechanism, this machine was developed with a two-platen mechanism like those of medium and large hydraulic machines, making it small in size and easy to maintain.

By applying a system comprising of four 1FT6 water-cooled synchronous motors, a 1PH8 asynchronous motor, and five Sinamics S120 drives to the injection axis, mold positioning axis, and plasticizing, the best results in terms of speed, cycle time, accuracy, and energy savings are achieved. Engineers from Siemens Germany in Cologne and Erlangen participated in all stages from early development to machine commissioning. Potential problems were minimized by predicting issues related to machines and control through a kick-off meeting, on-site mechatronic support, and training on the IMX injection molding platform. The issues that arose during molding at the end user’s site were solved by online remote support from Siemens headquarters in Germany and the technical support of a local Siemens subsidiary.

Leading solutions for a high-end market

With the development of the LGE2000HB, LS is expected to provide leading solutions for the high-end molding market and set a new standard in the large-sized injection molding machine market.

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In recent years, Munich-based KraussMaffei Technologies GmbH has developed more and more into a provider of complete production cells. With the machine series AX, CX, EX, and MX, KraussMaffei covers almost all injection molding technology process variants. The EX series in particular is considered to be a technology innovation par excellence: the machines control the shaping of plastics with the fastest dry cycle times in the industry. This is made possible by the unique Z lever at the heart of the system.

The EX series was also developed for absolute clean-room compatibility and sets standards in clean-room manufacturing. At the K 2010 trade fair, an EX 160-750 CleanForm will demonstrate the first fully electric solution for sterile mass production in a Class A clean-room environment according to GMP. For the production of injection cylinders from polypropylene in a 48x tool, the infrared robot removes the parts from the tool and transfers them to a sluice chute for the packaging unit. Because this allows the implementation of solutions with direct packaging in a germ-free environment, subsequent sterilization is unnecessary.

**Highest quality with high-torque motors**

The equipment of the EX series provides for extraordinary precision, high dynamics, and absolute cleanliness using a directly driven electrical drive unit. “The control and drive are one unit and were developed by Siemens engineers in close cooperation with our specialists especially for the EX series and for use in clean rooms,” explains Dejan Hense, project manager at KrausMaffei.

Two coupled direct drives carry out plasticizing and injection, for which KraussMaffei relies on high-torque motors. The force is directly transmitted to the screw, which ensures high efficiency. Both direct drives are arranged in one axis and feature a simple design. They do not have gears and are completely encapsulated. The drive concept ensures high shot weight consistency and great reliability in production. Every axis in the innovative design has its own electrical drive (Sinamics) that can be controlled in parallel – enabling a higher production speed.

Another advantage of the EX models: all motors and converters are water cooled and are thus very well suited to clean-room production. The complete encapsulation of all drives means that no abrasion dust can escape into the environment. The noise level is also significantly lower. Last but not least, the electrical drive technology with optimized servo-motors uses up to 50 percent less energy and up to 70 percent less water than hydraulic machines.
MACRO ENGINEERING & TECHNOLOGY INC., CANADA

A Complete Control Package

A world leader in extrusion machinery uses Siemens technology to create perfectly wrapped rolls of micro-thin plastic cling film with even thickness and no tears.

"With the aid of Siemens products and support, we’re able to get our machinery programmed and delivered to the customer quicker."

Shailesh Shah, product manager at Macro Engineering & Technology Inc.

MACRO ENGINEERING & TECHNOLOGY INC., CANADA

A world leader in extrusion machinery for plastic film and sheet applications. One of Macro’s most recent extrusion systems is for PVC cling film roll production. Focusing on a complete turnkey package, Macro designed the entire extrusion system, from material feeding to winding to recycling of scrap, in addition to the complete resin recipe consisting of PVC, plasticizer, and other additives. "Offering a complete package that includes the formulation, machinery, installation, and training offers the processor the ability to get up and running faster," said Shailesh Shah, product manager at Macro. "With the aid of Siemens products and support, we’re able to get our machinery programmed and delivered to the customer quicker."

Tight control of the extruder and die temperature zones is vital to ensure consistent melt quality, particularly since the line is extruding very thin films in the 9–15 µm range. To achieve this, Macro selected Siemens’ TCP-3000 temperature controller package, which contains the programmable logic controller (PLC) program and HMI screens already built and tested.

"The use of Masterdrives, S7-300 PLC, and MP377 HMI on both Profibus and Industrial Ethernet helped us ensure tight controls and synchronized communication between the components," states Shah. "Tension must be controlled with precision to avoid excessive stretching, slack, or tears in the film that could cause a break in production."

Perfect and versatile windings

Another product Macro developed with support from Siemens is the AUTOMAX-SBG Reversible Surface Winder. Unlike traditional surface winders, the AUTOMAX-SBG can wind rolls with the film’s treated side in or out. The winder also has a vacuum drum that adheres the leading edge of the film to the drum during cutovers. This helps produce straight edge cuts without foldover. The result is perfectly wound rolls with flat, wrinkle-free film completely usable to the core. Simotion D425 with Sinamics S120 drives were used with 1FK7 servo and IFW3 torque motors to provide the high-speed accuracy required for the winding and roll change operations.

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Extrusion system for PVC cling film roll production
Today’s packaging sector uses multilayer films made from increasingly complex materials and resins. The majority of production generally takes place in three-layer coextrusion systems; however, since the end of 2007, the Italian mechanical engineering company Macchi has increased the number of coextrusion lines for manufacturing barrier films for flexible packaging with more than three layers, and is today manufacturing systems to produce films with seven to nine layers. The main

**Extrusion**

Coextrusion line for manufacturing barrier films with seven to nine layers

- Macchi S.p.A., Italy

**More Layers, Less Resin**

When it comes to sustainable and resource-friendly production, the Italian mechanical engineering company Macchi relies on a multilayer process for manufacturing film packaging, which saves valuable resin.
The reasons behind this strategy, aside from the improved technical and applicative characteristics of the films, are ecological sustainability and a more conscious use of resources.

**An effort that pays for itself**

The decision to migrate from systems producing three to five layers to systems producing seven to nine layers was based on the need to both reduce consumption of expensive barrier-effect resins and reduce the number of connecting layers to a minimum. Today it is possible to produce layers of EVOH (ethylene vinyl alcohol) with a thickness of only 5 μm or even 3 μm, for example. In addition, coextruded films in which the “barriers” are divided into different layers have a higher resistance to low temperatures and also show better thermoformability.

The implementation of these multilayer systems requires detailed know-how and the ability to ensure absolutely precise thresholds with regard to film thickness. This is because even the smallest variation in dimensions can result in a product that is both nonconforming and not cost-effective or marketable. An additional challenge of this technology in terms of quality is that the thickness of each individual film layer cannot be controlled by a dedicated controller. Factors crucial for excellent film quality are an optimum coextrusion head as well as having absolutely constant speed, pressure, and melt flow. These factors are guaranteed by Siemens torque motors. This is precisely where Macchi has achieved its competitive edge, and where its success as a company lies.

**New torque motors guarantee quality**

In its new extrusion lines, Macchi relies on a new generation of torque motors from Siemens, which stand out for the following advantages: they enable screws to be extracted from the rear of the extruder via hollow shafts to facilitate maintenance, and the motors achieve operating currents that are up to 30 percent lower than their predecessors, thereby reducing output and dimensions while retaining the same torque.

In processes with nine layers, where absolute precision in the thicknesses of the different layers is a fundamental quality criterion, the use of direct drive technology offers a clear benefit: thanks to the torque motor’s high level of precision in terms of torque and speed, the pressure of the melt flow can be controlled accurately, thereby ensuring that the finished product has ideal features.

Reducing the torque also affects the output of the motors used, as well as the size of the switchboards and wire diameter. With all these features, the platform requires less space, the machine is quieter, and consumption is reduced.

**Protection for winders and stretching machines**

As belts, belt pulleys, and reduction gears are no longer required thanks to the direct drive technology in the torque motors, strain on the winding systems and stretching machines in the Macchi systems during operation is also reduced.

The Bo Plus winder is regarded as one of the most efficient film winders on the market today. This machine can be configured in various ways depending on the type of film being manufactured. The stretching machines are available in different widths and have technological and design features that make them suitable for use in difficult conditions. The use of torque motors eliminates mechanical play, maintaining the torque at the exact level required and enabling precision and speed dynamics to be regulated accurately. The result is a high-quality product that satisfies all customer demands with regard to uniformity and tear strength.

**The Sinamics S120 – a flexible converter system**

With its new extrusion line, Macchi is using not only torque motors but also a modern drive concept developed by Siemens. Thanks to its versatility, the modular Sinamics S120 converter range is ideal for controlling a wide variety of applications – from extruders right through to complex multiaxis applications such as the Bo Plus winder line. The Sinamics converter for winders consists of a common supply module, which is coupled with several powerful modules in order to save space in the switchboard. In addition, all systems are connected to Profibus, allowing the quick and constant transfer of information between the control unit and the drive. Macchi uses the specialist software WinAC Servo Light throughout the entire line; this software was specially developed by the center of excellence in Milan for controlling stretching machines and winders. A special tool for teleservices allows all devices in the network to be accessed for diagnostic purposes in the event of a fault. “Engineered by Macchi –Powered by Siemens” – with this successful strategy, the Italian mechanical engineering company is optimally equipped to face the ever-growing challenges of the future.
Leistritz Extrusionstechnik GmbH, Germany

One System,
Many Options

A flexible system and well-conceived automation results in an efficient solution.

Leistritz Extrusionstechnik GmbH is known worldwide as a manufacturer of twin-screw extruders. For more than 40 years, efficient complete systems for plastics processing have been built at the company's Nuremberg headquarters. Leistritz has also been successfully producing machines for the pharmaceutical industry for several years.

Leistritz's showpiece
In accordance with the slogan “refreshing extrusion technology,” the extruder generation of the ZSE MAXX series offers refreshing and innovative machine technology: high torque and high volume are combined in one machine. Entirely new possibilities open up for the user, including a significant increase in throughput and an extension of the process window. To put it another way: while engineers previously needed to decide in favor of either a high-volume or a high-torque machine, they now get both advantages in one machine. Due to its flexibility, this product series creates new opportunities for increasing productivity. For production, this means an increase in efficiency, providing for a sustainable future. The ZSE MAXX series offers extruders with screw diameters of 27 mm to 180 mm. With the modular screw and cylinder systems and a sophisticated drive kit with a large selection of gears and motors (screw speeds of up to 1,200 rpm), the machines are used in a wide variety of applications.

Intelligent control
Control of extrusion plants is a very broad and important topic because this control is the only way to ensure cost-efficient and optimally coordinated interaction between material feeders, extruders, and subsequent aggregates. With the data that converge and are input on the operating unit, the HMI, the entire extrusion process is controlled, monitored, documented, and analyzed. For its automation solutions, Leistritz makes use of proven Siemens hardware components that are individually programmed based on the machine and customer requirements.

“Particularly in regard to good quality, fast response times, and high availability ensured through a globally active service network, Siemens represents exactly the right partner for us.”

Dr. Hubertus Schulte, CEO of Leistritz Extrusionstechnik GmbH

Real-world example
The Plastics Technologies department at the University of Wismar, Germany, headed by Prof. Harald Hansmann, has added a real “all-rounder” to its facility: the ZSE 27 MAXX. Using a wide variety of additional aggregates, this laboratory can compound polymers, nanofillers, or wood fibers at a high throughput rate. The machine can be fed with the
individual components of the formula using gravimetric proportioning and a side feeder. Depending on which formulation or material is involved, the melt is distributed and granulated as a strand using a discharge conveyor with an integrated air shower or processed into granulate using air or underwater granulation.

The plant is controlled using a Simatic S7 controller. Leistritz uses the newest control generation here: the hardware basis for easy operation and monitoring is an IPC (industrial PC) 477. The integrated 15-inch touchscreen allows visualization. Programming is based on Simatic WinCC flexible with Soft-PLC WinAC RTX. All setting and control procedures on extruders and additional aggregates can be carried out and monitored on the operating unit, and all existing proportioning is controlled using this unit. For underwater granulation, the start-up valve can be controlled, for example. The start-up process is optimized in this way, allowing any start-up waste (melt that escapes from the extruder) to be minimized. The innovative Simatic controller allows up to 20 variable-speed drives and up to 32 temperature zones of the heating and cooling to be controlled and monitored. The derived process data are archived and saved with up to 256 customer- and product-specific settings (such as formulas) on an integrated flash card.

Another relevant feature in this context is the Leistritz Chart Pilot. This software allows the user to display process data from the Simatic S7 on an office PC system. Using this software enables clear and easy analysis, filtering, and integration of measured data. It supports the user in the creation of graphs for process data analysis. Another plus: the measured data can be imported into Excel, for example.

This combination of advanced control technology and excellent mechanical engineering provides Leistritz customers with a highly flexible, state-of-the-art extrusion line.
The main aims behind the development of the new 2010 extrusion line for High Tech Extrusion (HTE) were to achieve significantly higher output, attain greater systems and energy efficiency, and ensure ease of use and monitoring. HTE, which was formed from the merger of Theysohn, Topf, and Technoplast, has pooled expertise for the wider procedural optimization of the entire extrusion chain – from the extruder itself to processing equipment and tools.

In addition to the unique design, the uniform, standardized structure of the new modular extrusion lines has been a particularly important factor for HTE. This structure means that all system parts are compatible with the latest Siemens electrical, control, and drive technology, and that they are networked together via Profibus. The most striking feature of the modular line is the lack of hoses and cables. Instead, there are multipole connections for the power supply and measuring signals between the extruder and nozzle, quick coupling blocks for the vacuum and water supply between the calibration table and calibrating device as well as a single installation level between the tool and calibration table. The system is fully backward compatible, so existing tools can be installed without any restrictions.

In order to optimize the plasticization process and at the same time to further increase output, the proven screw technology was further developed and the L/D ratio increased. The energy balance has improved significantly, thanks to the addition of frequency-controlled drives for the vacuum and water pumps at the calibration table, an approach that had previously not been tried. The power required for the vacuum pump motors has therefore fallen from 4.3 to 1.1 kilowatts. As regards the extruder, a highly efficient gearbox, insulated heating bands, optimized screw geometry, alternative fan technology, and reduced water consumption have all contributed to an improved energy footprint.

Automation systems from a single source

The programmable logic controller (PLC) for the 2010 extrusion line includes a Simatic 427C microbox with the WinAC RTX real-time extension of the latest expansion stage and the highest performance level currently available. The PLC’s Intel Core 2 Duo processor was officially designed as a way to separate the operating system and visualization (Windows XP Professional / WinCC flexible) from the real-time controller (WinAC RTX). This means that it is easier than ever for the line to continue to run unaffected or be shut down correctly if the operating system crashes.
All input and output signals are controlled by the Simotion E510 distributed station, which was specially developed for use in plastics technology. The scalable system cost-effectively caters to different quantities of I/O devices. With regards to the drive, converters from the Sinamics G120 series are primarily used and drive a large proportion of the motors. The remaining motors are connected with motor starters from the ET 200S line.

A Sinamics S120 series drive on the caterpillar, to which the separator is attached, ensures greater accuracy in separating the profiles (either by saw or guillotine). HTE uses the integrated Sinamics basic positioning function to generate a cut signal at exactly the right position.

The window to the line operation is a pivot-mounted IP65-rated Simatic Flat Panel Pro with a 19-inch touchscreen display on the extruder. The entire line can be operated and monitored using this screen. There is an additional Simatic OP177B operator panel for operation functions at the end of the line; this panel is also standard for stand-alone calibration tables.

Integrated Profibus-compatible components allow for diagnostics via intranet and Internet. The manufacturer’s service technician can easily log into an extrusion line from the other side of the world and perform a diagnosis up to the drive level. He or she can offer targeted troubleshooting support to the user, keeping availability high, without needing to be on-site.

One source – no problems

“From the outset, Siemens’ integrated automation technology has saved us a great deal of work on calibration, as the interaction between all the components is tested from the start – and it works, simple as that,” says René Theimer, head of development at HTE. “The Siemens brand is recognized by users in the plastics industry worldwide; in many cases it is even requested. Siemens speaks our language and knows the specific requirements of our processes, which, for this complex project, has meant that they were quickly able to find the optimum solution, in terms of both technical and commercial considerations.” Sourcing everything from one supplier can also dramatically simplify the ordering process.

The high productivity and energy efficiency levels of the new 2010 extrusion line have been proven in tests performed over the course of several months at HTE and other selected pilot locations. The entire package is ideally suited to profile extrusion using modern profile tools with very high throughput levels. The first two extruders including follow-up equipment will be available at K 2010.
ER-WE-PA GmbH, Germany

Consistent Quality

For the production of a variety of windable materials for technical applications and packaging, ER-WE-PA relies on single-source Siemens technology – from the extruder to the innovative winder.

Coated foils for packaging and technical applications are a huge growth market worldwide. The Davis Standard Converting Systems Group, with its American subsidiaries Black Clawson and Egan, as well as ER-WE-PA GmbH in Erkrath, Germany, specializes in the manufacture of machines and systems for producing multilayer foils and comparable composite materials. A wide spectrum of materials for a variety of applications are processed, including products such as technical foils over flexible packaging, box coatings, woven mesh for applications in construction above and below ground, and nonwovens (e.g., for diapers). The demand is enormous in China in particular – approximately 40 percent of ER-WE-PA’s machines are exported to this market. To meet the increased demands of its customers, the Erkrath-based company offers coordinated systems making use of co-extrusion units, the newest winder technology, and efficient automation and process control.

High speeds achieved

In order to produce high-quality foils and composite materials, the preproducts – paper, nonwovens, foils – must be unwound, and the finished products must be wound up again. High speeds are important for achieving high productivity. At the K 2010 trade fair, ER-WE-PA will introduce a new horizontal winder designed especially for the winding of high-quality composite materials. With speeds of 800 to 1,000 meters per minute, this winder is about twice as fast as previous winders. The machines are flexible and can be used with a variety of extruders and unwinding stations. They make it possible to automatically change rolls even at the highest speeds and allow the tracks to be automatically connected in order to maintain uniform roll weights in the finished product. The very high speeds place great demands on the control and regulating technology, however. These demands include the need to maintain the traction forces in the tracks at tight tolerances and to adjust them to the respective materials for all processes. This can only be achieved with mature, high-quality, and carefully coordinated drive, control, and regulating technology.
Winding performance with motion control

That is why ER-WE-PA decided to use the Simotion motion control system for the first time. The drive-based Simotion D4x5 enables individual control of each drive position, thus ensuring the highest possible consistency and quality of the process. This allows sensitive or complex materials that tend to vibrate and wrinkle to be precisely wound at high speed. With the Converting Toolbox for Simotion, Siemens offers a software program that contains an extensive repertoire of standard functions for winders and saves a great amount of engineering effort. This makes it possible to automatically change the reels at full speed. ER-WE-PA uses the openness of the software to make individual adjustments. For the winders, Sinamics frequency converters are used, which are coupled with Simotion using Drive-CLiQ.

Thanks to the innovative system bus, the parameters of the drive components do not need to be set by hand in a cumbersome manner. Defective parts can thus be replaced quickly.

Safety standards play a major role in winding applications. For the new horizontal winders, the logic and safety tasks are controlled by a fail-safe Simatic S7-317F, which is connected with the other parts of the system using Profisafe. For fast and easy setting of the parameters and convenient process monitoring, the 15-inch Multi Panel MP377 with Simatic WinCC flexible is available to the operators.

Consistent melt quality

The heart of every foil processing line is the extruder. Due to the high standards to which the end products are held, the processing of new plastics is becoming more important. Flexibility in production is thus the most important factor for every manufacturer that wants to assert itself in the market. ER-WE-PA is optimally prepared in this regard: with coordinated screw designs and nozzles that were internally developed and produced based on experience gained in several decades of extruder technology, the company is achieving optimal coating quality for a wide variety of polymers. ER-WE-PA relies on tried and tested automation technology. The Sinamics modular drive system features easy networkability. In order to introduce the drive energy into the screw in a precisely controlled manner, compact and efficient 1PL6 asynchronous servomotors are used. A Simatic S7-400 high-end controller takes care of the higher-level machine control and precise temperature regulation.

A coordinated system

ER-WE-PA is completely satisfied with the end-to-end automation solution for its extruders and winders. “Siemens provides us with drives, controllers, programming stations, and operator stations from one source,” says Andreas Kandt, CEO of ER-WE-PA. “All components are coordinated with each other and work together in an optimal manner. Service and spare parts are also available worldwide within a short period of time because Siemens now has a presence on all continents. This is a decisive criterion for an internationally positioned company such as ours, with a high percentage of exports to Asia.”

For high-tech materials:
the co-extrusion units from ER-WE-PA
Geiss AG, Germany

Pushing the Limit

New drive concepts and intelligent motion control enable to explore new possibilities in twin-sheet forming.

Twin-sheet forming is an established process for manufacturing complex hollow and lightweight parts from two thermoplastic sheets. The process had previously reached its limits with material thicknesses of less than 1 mm. This was due to the thin sheets cooling before the tool could be closed and the material formed and welded. Geiss AG from Southern Germany, a longtime leader in twin-sheet forming technology, has now pushed the technology past this limit thanks to a new drive concept in its latest machine generation, the Geiss T9.

The new drive concepts and Simotion have enabled Geiss to expand the scope of its twin-sheet moldings to include thin-wall components with thicknesses down to 0.3 millimeters.

A 1FT7 servomotor moves the 5-point toggle lever via a central ball-bearing spindle for the upper punch and table according to a cam disc generated in Simotion D435.
The basic idea was to employ 5-point toggle-lever kinematics to open and close the two halves of the mold, combining a highly dynamic process speed (particularly in the return stroke) with a high level of clamping force and precision. This enables clamping times of considerably less than one second to be achieved so that even sheet thicknesses of 0.3 mm (up to 2.5 mm) can be processed with exact reproducibility. The tried and tested closed-chamber system prevents the heated material from sagging, thereby guaranteeing optimum process conditions when handling practically all deep-drawing materials such as PS, ABS, PET, PMMA, PE, PP, PC, and PEEK. Additionally, high clamping forces of 60 t also enable prepunching and punching of parts in the machine.

The toggle-lever closing system integrated seamlessly into the modular Geiss system, thereby ensuring that it was not necessary to develop a completely new machine.

**Simotion as standard**

The speeds of the clamping system need to be freely programmable, while precise control must particularly be guaranteed at the limit positions. Speeds must also be adaptable to the mold size, molding geometry, and vacuum flow. A solution with a servomotor and central ball-bearing spindle was therefore required for the toggle-lever drive. Additionally, the existing Simatic S7-300 process control and the proven Siemens heating control had to be retained, as all previous machine characteristics needed to be maintained without modifications. The solution developed jointly by Geiss and Siemens in less than three months provided the first ever motion control system for the toggle lever. The choice fell upon a Simotion D435, which is connected to the process control system (Simatic S7-300) as an intelligent DP slave (i-Slave) via Profibus and which transfers the data via its data modules.

Like the latest Sinamics S120 drive generation and the latest 1FT7 servomotors, the Simotion D is set to become the new standard for all servomotor-driven machine variants from Geiss. At a constant output, the 1FT7 motors can even be operated well above their actual nominal speed in the so-called field-weakening range. The resulting opportunity to design lower outputs from the outset not only saves space in the control cabinet but also reduces costs.

**Motion control made easy**

The proven HMI system was also meant to remain unchanged and to access only the Simatic data modules, not the Simotion system. Siemens adjusted the background data management accordingly and made no changes to the WinCC flexible interface on the Simatic panel PC – also standard in all Geiss machines. This enables motion sequences to be adjusted individually to different twin-sheet parts, as previously. “Users do not want to be concerned about the internal workings of the machine, nor should they have to be. Their priority has to be the process and their moldings,” explains managing director Manfred Geiss.

Separate screens for top punch and table can be set and/or edited extremely precisely by the user, along with the familiar travel paths/speeds and any stopping points. Simotion coordinates the drives via a cam disc, while servo-driven spiked chains guarantee precise synchronization of the upper and lower material transportation from the roll. For thicker materials, an alternative automatic or manual feed with precut plates is available. Additional three-phase motors allow the two halves of the tool to be moved up or down independently of one another, enabling the respective block heights to be adjusted quickly and easily. This eases and accelerates tool changes and keeps changeover times to a minimum.

**Proven in practice**

Ernst Hombach GmbH & Co. KG, in Uehlfeld, is the first operator to use the new Geiss T9 with the toggle-lever closing system. This twin-sheet pioneer, also from Southern Germany, has been manufacturing the most demanding thermoplastic parts for a wide range of applications for years. Thanks to the Geiss T9, Hombach is now able to produce thin-wall applications that were previously almost impossible or extremely expensive, including, for example, stable and lightweight heat-exchanger films, decorative lightweight panels, and translucent honeycomb structures for bioreactors.

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**Automation and drive technology at Geiss T9**

- Motion control system: Simotion D435
- Process control system: Simatic S7-300
- Heating control system: HCS716l
- Drive: Sinamics S120
- Servomotors: 1FT7

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Exceptional Automation

A complete, reliable, and efficient system of robots and peripheral machines taps the full potential of an injection molding machine.

GeKu Automatisierungssysteme implements individual solutions for the automation of processes for the manufacture of plastic, rubber, and metal. The handling of parts is usually accomplished with three-axis robots that GeKu builds itself in all required sizes and variants using very robust and hence low-vibration steel or aluminium designs. In collaboration with Siemens, new automation standards were recently created that make development easier.

Complex injection molding processes simplified

How important the control of peripheral processes is for successful automation is shown in the example of a horizontal injection molding machine with quad tool. Using such a machine, the Lübbecke-based Alhorn company manufactures contact sockets. The complete process execution goes far beyond just the handling of parts.

In the automated manufacturing process, the contact plates are first removed from the hasp using a feed device and separated at a precisely defined position using a punch. “The contacts must not be bent in the slightest in the process. The grippers must also not leave any marks, particularly not on the tin-plated or gold-plated areas of contact pins,” points out Joachim Winter, chief designer at GeKu. The contact plates that have been punched free are conveyed to an intermediate receptacle using a motor-driven linear axis.

“We designed the intermediate receptacle so that both three-contact and four-contact sockets could be manufactured without major retooling,” explains Winter.

It is not until this point that the actual handling robot comes into play. It retrieves the positioned contact plates from the intermediate receptacle and...
For its parts handling, GeKu primarily uses three-axis robots with Simotion control which it designed itself.

Inserts them into the injection mold. The robot’s gripper is designed as a combination gripper in this machine. As a result, it can immediately retrieve the socket that was manufactured in the previous process cycle and transfer it to a test station.

At this point, the machine operator first requires that the contact resistance and the dielectric strength be tested. These and the following product tests are also part of the automation solution supplied by GeKu. From this electrical test, an additional gripper transports the socket for a mechanical checking of the contact pin symmetry, during which the contact socket continues to be held by the gripper. The good parts are marked with a punch device mounted directly on the gripper and placed onto the output belt for packaging. The gripper discharges rejected parts by dropping them into trays sorted according to the cause of the defect.

**Standard application for handling robots**

In contrast to the application-specific process periphery, the handling tasks carried out by the robot are largely independent of the application. It therefore made sense to develop a standardized control and drive solution for handling robots. In conjunction with the Siemens Application Center in Cologne and using the Simotion motion control system as the basis, GeKu developed a handling application for which all parameters can be set using the HMI panel. This allows the parts handling of the GeKu robots to be put into operation immediately without any additional programming – something that works for a wide variety of processes, machines, and products.

The new standard application includes the complete hardware and software for robotic automation and is used for all handling tasks in the production processes developed by GeKu. In fact, this solution represents a robot control system for which all parameters can be set. This allows the company’s developers to save time on every order. They can now focus their attention more intensively on the important tasks in the process periphery – with a time advantage that can be decisive for an order when deadlines are tight.

Since the Simotion CPU is usually not using its full capacity for robotic control with parts handling, it can also take over additional tasks. These primarily include the control of modules and stations of the process periphery, which often have a large number of sensors and actuators. For efficient connection of the I/O signals, GeKu uses Simatic ET 200 peripheral stations, which are connected with the controller using Profibus.

“In the automation of manufacturing and production systems, the collaboration with Siemens gave us the ability to always use the same system structure, one that was uniform in terms of both hardware and software. In the process, we were able to concentrate from the beginning on the most demanding application-specific processes in the process periphery,” summarizes Winter. “This very much suits our strategy of offering robots and peripherals from one source – if nothing else, for the benefit of the end user, to whom we can offer what is needed for efficient and profitable production.”

A handheld operating terminal with touchscreen brings the operator into direct proximity with the production process.

Machines are not efficient production systems until a handling system and the corresponding process peripherals are added.

Machines are not efficient production systems until a handling system and the corresponding process peripherals are added.
Savings through Retrofitting

The retrofitting of a fixed displacement pump with a servomotor on a hydraulic injection molding machine allowed the machine’s power consumption to be reduced by more than 50 percent.

BSH Bosch und Siemens Hausgeräte GmbH manufactures approximately two million vacuum cleaners per year. Approximately 60 percent of the company’s electrical power consumption is attributable to the manufacture of plastics. An energy efficiency analysis showed that the greatest potential for energy savings was with the hydraulic injection molding machine drives, particularly because these were largely operated at a constant speed until 2008.

Alternative drive concepts that could be easily retrofitted onto existing production machines were particularly in demand. A solution was found at the Siemens Application Center in Erlangen, Germany. A system with servomotor drives and a fixed displacement pump was already in operation there. In contrast to traditional drives, the motor rotates only when loads are being moved on the machine.

For a joint field trial, the Demag D60 NC3-P 600-182 from 1991 was chosen. It can produce a polyamide four-impression mold at a machine load of 60 percent. Because a technical automation refurbishment had already been carried out on the machine with the IMH 3300 solution based on Simatic S7, short reaction times were ensured during the test phase. The drive consisted of a controllable vane pump with a flow rate of 65 liters per minute and a fixed displacement motor with a drive capacity of 15 kW.

BSH decided to use a Sinamics S120 with a Voith fixed displacement pump. To integrate the hydraulic system, all that was needed was a pressure transducer, a pressure-limiting valve, the intake line from the hydraulic tank, and the pressure line. The servo-drive and the associated switch cabinet were connected to the Simatic controller and the converter. The setting of drive parameters and the signal exchange between the injection molding machine and drive controller followed. Production began with the previous setting parameters in order to draw conclusions about the control behavior of the servo hydraulics.

Amortization within a year and a half

The retrofit reduced the power consumption of the machine from 15 to 6 kilowatt-hours over an observation period of two weeks. The noise level of the servo hydraulics was barely perceptible. Since hydraulic oil is pumped only when required, an oil cooler could be omitted for this application – which meant that even more energy could be saved.

If operated for 6,000 hours annually, the machine saves 54,000 kWh of electricity, which corresponds to an annual savings of 6,500 euros. Comparisons show that this solution can achieve almost the same level of energy efficiency as a fully electric injection molding machine.

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Back on Top Form with New Standards

Siject BMH 3300 ensures high availability and productivity for blow molding.

For most people familiar with the brand, “Rolly Toys” brings to mind children’s tractors, scooters, and pedal cars. Not many know that Franz Schneider GmbH & Co. KG, based in Neustadt near Coburg, Germany, is behind these products. To ensure that its high quality standards continue to be maintained in the future, the toy manufacturer decided to gradually replace the outdated, and in many cases difficult to access, special control systems for the company’s blow molding machines with modern and open-standard systems.

Siemens has been Schneider’s first choice for retrofits for a number of years. By working with Siemens, Schneider can ensure that every process – from training, engineering, and operation to spare parts and servicing – can be simplified and made more economical.

Tailor-made from standard components

Siject BMH 3300, the Siemens automation solution for blow molding machines, relies completely on standard components. This solution builds on the established Siject BM and thus guarantees that users who are familiar with Siject will also find this new solution easy to use without a lengthy familiarization process. This is true not only in terms of engineering, but also for operation and monitoring.

“The key advantage of the blow molding software (which now truly is open in every respect) is the fact that we have access to every last bit and can configure the application exactly to our needs,” explains André Rößler from the Schneider maintenance team. “Furthermore, previously optimized processes can, in some cases at least, be transferred and adapted on similar machines, meaning that this process takes considerably less time than starting from scratch each time.” As a result, the suggested 14-day time frame for retrofitting has so far always been adequate, keeping production downtime to an acceptable level.

Should a programmable logic controller (PLC) or peripheral component ever fail, however, the company can use a machine that is not currently in operation in the factory to easily avoid bottlenecks. With the old special control systems this would not have been possible. Schneider is very happy with the retrofit and is already planning to equip around a dozen further blow molding machines with the current Siemens standard.

Sitect BMH 3300:
- Simatic S7-300 standard control system (options of fail-safe version and PC-based alternative)
- Simatic ET 200S input/output modules (in standard and ProfiSafe versions)
- Scalable and therefore cost-optimized Simotion E510 I/O peripherals
- Visualization via Simatic Multi Panel MP377 (or PC 477B)
- Preinstalled software module for the Simatic WinCC flexible HMI system (for blow molding technology functions)
  - Wall thickness control (WDS)
  - Temperature regulation (TEMP)
  - Combined position and speed regulation (MOT)

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The Electrolux Group in Porcia, Italy, produces around 1.5 million upper-midrange washing machines annually. One of the most important components in a washing machine is the washing unit with the tub and drum. The Electrolux plant comprises around 20 large-scale injection molding machines that produce the tubs from carboran, a highly refined and fully recyclable plastic. As the injection molding lines are in operation around the clock, any unforeseen machine downtime has significant consequences for the continuity of the overall production cycle.

Modernization aids risk prevention

In collaboration with Siemens, Electrolux has initiated a project that minimizes the risk of unwanted machine downtime and that should reduce the maintenance costs of the injection molding machines. “In the injection molding sector we use numerous large-scale machines that are still performing extremely well despite being 15 to 18 years of age. The disadvantage lies in the manufacturer-specific programmable logic controllers (PLCs), which require a lot of effort to maintain and adapt to new production requirements,” explains Andrea Stival, maintenance manager at Electrolux. “We therefore came to the decision to modernize the automation technology for these machines.” In the search for a suitable solution, Electrolux turned to the Siemens center of excellence for the automation of injection molding equipment, and its extremely competent expert in this area, external solution partner Jürgen Lenz. Stival confirms: “This was the start of an outstanding partnership. The results have far exceeded our expectations.”

Flexible and high-performance control architecture

The first modernization project was carried out on a mechanical/hydraulic injection molding machine with 1,300 t clamping force. Its original control system was replaced with the IMH 3300 automation system.
solution based on a Sitect CI 16iP controller for hydraulic injection molding machines. During this project, tried and tested standard products from the Simatic line, including PLC peripherals, communications buses, and standard user interfaces, were employed. Lenz designed the wiring diagram and automation, while the Electrolux maintenance department carried out the installation of the hardware and the cabling.

Due to the optimum results, this project was immediately followed by the next IMH 3300 upgrade, this time on a 1,000-t hydraulic injection molding machine. In this case, a Simatic S7-300 (CPU 319-3 PN/DP), with integrated Profinet interfaces, controls and regulates the movement of the injection molding cylinder (by controlling the oil pressure and quantity) and all machine movements, including the temperatures of the injection molding cylinder and the additional 64 heating and cooling zones in the tool temperature regulator. The peripherals (Simotion E510 and Simatic ET 200S), control panel (Simatic MP377 Multi Panel with touchscreen display), and temperature regulator are connected to the PLC via Profinet. “This solution not only met our goals in terms of compact design, ease of maintenance, and expandability,” enthuses maintenance technician Claudio Maranzana, “but the speed and precision of the mold heating and cooling control processes has also dramatically improved.”

The result is a distinct quality improvement, particularly in terms of the reproducibility of the injection molded products, which has made quality control and process engineering considerably easier. Remote control and connection of the injection molding machinery to the plant’s monitoring systems were also completed smoothly. Thanks to the integrated Profinet connection, only a single cable connection is required to link the machinery to the network.

An almost identical automation solution was also implemented on an electrically driven injection molding machine with 165 t of clamping force.

Increased competitiveness
The results have prompted Electrolux to choose the Siemens control architecture for future conversions of the machinery in its injection molding plant.

Stival sums up: “A great benefit of the selected automation solution is the openness of the system. The Simatic Step 7 programming language allows us to carry out any adjustments ourselves, thereby enabling us to respond much more quickly than previously. This is one of the reasons for the considerable increase in our competitiveness. Another reason is the level of reliability achieved with the new automation systems. The risk of unforeseen operating failures has also been dramatically reduced. For us maintenance managers, it is reassuring to know that the first thing we have to do is look for the keys to the control cabinets, as this means we really can stay in control!”

Andrea Stival, Maintenance Manager, Electrolux

»For us maintenance managers, it is reassuring to know that the first thing we have to do is look for the keys to the control cabinets, as this means we really can stay in control!«

Graphical display via a Simatic MP377 panel with matching control keypad for injection molding machines

The injection molding lines in Porcia produce 1.5 million tubs per year
Franz Griesel, CEO of Mangfall Plastik GmbH, was searching for an innovative solution for an aging machine when he visited the booth of International Industry Service (IIS) UG at the Fakuma trade fair in October 2009 in Friedrichshafen, Germany. Would a conversion of the existing machine be possible? He arranged an IIS visit to the Mangfall Plastik factory in Rosenheim, and the machine in question was examined. IIS agreed that conversion was possible, and the retrofit could begin.

Mangfall Plastik produces plastic parts for various industries using machines with 10 to 350 t of clamping force. For some specialized products, the company used a 350-t machine with a horizontally adjustable injection unit and high injection volume. Its major drawback was its poor operational reliability – the manufacturer had discontinued support for the 25-year-old machine. Provisional solutions and makeshift repairs kept the machine running, but it was time for a new, innovative solution.

Old becomes new and energy efficient
After checking the documentation, the team began the conversion measures. The machine was to be retrofitted with a Simatic S7 automation system and the IMH 3300 plastics package for injection molding machines. New wiring and a new switch cabinet were needed. The hydraulic installation height adjustment was to be converted from manual to electrical control, and the position detection system was to be equipped with contactless ultrasonic linear encoders from Balluff.

The machine was originally equipped with a 55-kW asynchronous motor with a triple-vane pump. Because the power-requirement testing during the cooling time already yielded a no-load power consumption of 27 kW(!), the consumption was analyzed in greater detail. The machine required up to 70 kW for some movements. With older hydraulic designs of this type, this energy is primarily converted into heat, which puts a load on the company’s cooling system.

Measurements showed that the conversion of the previous drive to a servo pump drive with a gear pump would be an investment that would pay off well. An IPV pump from Voith was thus installed for operation with servomotors and converters. The
energy saved in this way was projected to be at least 35 percent.

In order to make the retrofit as cost-efficient as possible and to take advantage of all available support programs, IIS quickly hired an energy consultant to investigate funding requirements. After the funding was approved, the conversion began.

Conversion and savings according to plan
The technical retrofitting of the hardware was carried out first. The new switch cabinet was selected so that the drive components and the control components could be accommodated in one switch cabinet. This made it possible to completely prepare the switch cabinet. Within just seven days after completion of the switch cabinet, the machine was rewired, the linear encoder was installed, the limit switch (protective grating) was replaced, and the new servo pump was installed with tubing and new pressure limitation after the old pump drive was removed. The commissioning of the servodrive, for which Siemens experts provided support, went smoothly. The installation of the IMH 3300 plastics package followed.

The Sinamics S120 servo converter is so intelligent that it takes over the control and regulation of the servo pump unit completely. It then controls the displacement volume and the pressure based on demand. After the S7 controller was connected, the first movements could be controlled in setup. Detailed setting of the axis movements followed.

Because the expertise of many different manufacturers flowed into the IMH 3300 plastics package, hardly any programming was needed. The current machine is a toggle-lever machine that can be set using the service configuration. After the automatic break-in of the cylinder heating, the machine was prepared for operating with a tool. After the individual parameters were set, the machine was already able to produce usable parts after less than 10 shots. For later tele-maintenance, the machine was also equipped with an Internet connection. The machine is operated using a swiveling terminal that is attached to the nozzle plate of the machine. An advanced touchscreen and a membrane keyboard for the control of all machine axes are situated in a compact housing. Only two weeks were needed for the entire conversion.

As Mangfall Plastik reports, the retrofit solved all the machine’s previous problems. In addition to benefiting from operational reliability and energy savings, the company is profiting from a robust machine with an advanced Simatic S7 controller and energy-saving drive technology. This allowed the plant to again reach a high level of availability. The software structure is open and can be upgraded at any time with extensions such as core pulls, hot runner technology, and so on.

The high level of noise produced by the old drive is also a thing of the past. Power consumption during the cooling time is today just 1 kW (approximately). The annual energy savings will thus amortize the cost of the drive after just a year and half – depending on the load placed on the plant. This will ensure cost-effective operation of the machine in the coming years.
Greater Energy Efficiency for Machines

The Application Center (APC) in Cologne has expanded its spectrum of services for the plastics industry.

Sentron Pac multifunction devices create the necessary transparency for optimized energy consumption.

The Application Center in Cologne offers advice on how companies can be more energy efficient.
The industry has been considering the subject of energy management and energy efficiency for quite some time due to rising electricity prices and legal measures such as the EuP directive and the German EuPA. The goal is to reduce energy consumption in order to be able to manufacture products in a more cost-effective and environmentally sound manner.

An energy management system allows the energy consumption of individual plants, or even entire sites, to be represented in a transparent manner on an enterprise basis. This can reveal energy-saving potential that no one was previously aware of. For example, load peaks can be avoided by rescheduling a process to another time period. But even investments that are amortized within a short period of time reduce consumption over the long term.

Optimization of the machine processes
Energy optimization generally used to be restricted to monitoring the entire system. The Siemens APC in Cologne also supports its customers in the optimization of machine processes. It offers tailored automation solutions for production machines, in particular for plastics processing machines such as injection molding machines, thermoformers, and blowing machines. The engineers have extensive expertise not only in the respective processes, but also in dealing with the corresponding applications and products. This allows them to find both new and optimized solutions to their customers’ problems and to carry out cost-effective retrofitting of existing machines. The optimization, implementation, and commissioning of an application allows the machine to be operated more productively and more efficiently at the same time. Even during the drafting stage of the application, attention is paid to operating the components of the plant so that they consume as little energy as possible.

Energy-saving potential through new motors
Electrical drives account for 70 percent of the industry’s power consumption. There is enormous potential here for saving energy. The staff at the APC in Cologne has access to the large and integrated Siemens product portfolio for efficient energy management. This includes such hardware components as the Sentron Pac for energy measurement, Sinamics frequency converters, Sirius soft starters, and energy-efficient motors.

Due to the IEC 60034-30 standard, which redefines the efficiency classes of electrical machines and harmonizes them on a worldwide basis, this hardware is attracting increasing attention. Although the standard is not binding until June 2011, the APC in Cologne is already incorporating the new motors into application simulations and identifying energy-saving potential in order to help customers avoid making bad investments. Due to the low lifecycle costs of energy-saving motors, the procurement costs can be amortized in a very short period of time in most cases.

To enable efficient energy management, the APC in Cologne also recommends the use of the b.Data, Simatic powerrate, or Sentron Powermanager software products. Another key to saving energy is switching off unneeded equipment during breaks in production and recording the energy values that are measured. This can be accomplished using the Profienergy data interface, which is based on Profinet.

Minimizing losses
The machine analyses offered by the APC in Cologne also contribute to efficient energy use. In each individual process in the production of a part, one energy form is converted into another, causing energy to be lost. The goal is to further reduce energy consumption through the minimization of these losses. An analysis of the machine captures all consumption of mechanical, hydraulic, pneumatic, and electrical energy using a suitable measurement device in each phase of the cycle. Where and when losses occur is specified in detail. Options for minimizing these losses are then developed and presented to the customer in a transparent manner. This makes it possible to increase the energy efficiency of individual components of the system using the extensive Siemens portfolio. The customer can work more productively, reduce energy and production costs, and increase plant availability.

With its integrated approach, the APC in Cologne is an expert partner in the effort to increase efficiency – from energy-optimized machine design to analysis of existing plants to advice regarding enterprise energy management systems. Working with the customer, it can develop a solution that is optimal and tailored to the company’s needs.
How can increasing energy efficiency demands become an opportunity for OEMs?

With an extensive and integrated portfolio of energy-efficient products systems and solutions.

For industry, energy efficiency is increasingly becoming a decisive success factor - and is also becoming more and more significant for you as OEM. As your partner, we support you so that you can deal with the increasing demands of your customers: We can offer you the most comprehensive portfolio worldwide for the implementation of energy-efficient solutions. Utilize the opportunity now to secure your competitiveness with energy-efficient machines and plants. More information at www.siemens.com/energy-efficiency-machinebuilder

Answers for industry.