Häfner & Krullmann GmbH (H&K), based in Germany, claims to be the top European producer of plastic spools and has been active in the molded thermoplastic parts market for more than 60 years. To make sure that stays this way in the future, the medium-sized enterprise is constantly improving its technological skills and, to an ever-increasing extent, the energy consumption of its injection molding machines.

The gear pumps of the hydraulics play a major part in these improvement efforts. The pumps’ power consumption drops by around half if they are fitted with controlled servo drives. Supplemented by new, standardized automation technology, users can expect increased ease of operation, process transparency, along with long-term reliability and production safety.

Those in charge at H&K became aware of these advantages after seeing comparable retrofit projects. They put the benefits to the test with the modernization of two 20-year-old injection molding machines that were still in good mechanical order but were no longer up-to-date in terms of control and drive technology and for which it was also no longer possible to ensure the long-term availability of spare parts. H&K replaced the old components with new process-controlled servo motors from Siemens on new hydraulic pumps from Voith Turbo H + L Hydraulic GmbH & Co. KG.

**Retrofits from a single source**

International Industry Service UG (IIS) from Meinerzhagen, Germany, specializes in extensive electrical retrofits of injection molding machines. In consultation with Siemens and Voith, IIS specified several suitable pump and motor combinations:
• IPVP series gear pumps, optimized for operation with servo motors. As one of Siemens’ latest developments, they are state of the art in terms of energy efficiency.

• Water-cooled compact Simotics M-1PH8 synchronous motors. These servo motors are each controlled via a converter from the Sinamics S120 drive family using a Sinamics CU310 control unit customized for individual axes. The closing, opening, and metering paths are detected via new, noncontact ultrasonic transducers.

**Process-compliant energy use saves energy and raw materials**

These modernized systems essentially use energy only during the injection molding process itself. During cooling and rest periods, the servo-driven pump comes to a virtual standstill, when previously only its output was reduced. This can be checked using a power meter incorporated via Profibus. And the result is quite remarkable. Klaus Lange, plant engineer and environmental officer at H&K, confirms that in regular production operation “50% savings are achieved in certain parts of the hydraulics.” Additionally, a high-grade energy-saving oil enables a hydraulic oil temperature of approximately 35°C instead of the previous 45°C and increases the service life of the ultrafine filters used. The machines’ noticeably reduced noise emissions are also a positive feature.

**Established standards ensure production safety**

IIS has implemented comparable retrofit solutions a number of times using standard Siemens components that are available worldwide. The centerpiece here is the IMH 3300 so-called plastics package for hydraulic injection molding machines. It consists of the CNC, I/O devices, and a controller with a preconfigured user interface for injection molding. IIS also reinstalled all electrical equipment, including the wiring harness and control cabinet, at H&K. Now reliability and the availability of spare parts are once more ensured, as the standardized IMH 3300 plastics package has already been successfully installed more than 300 times in a wide range of injection molding machines. The most striking innovation in the H&K machines is the Simatic MP377 Multi Panel WinAC MP control unit with a 12” touchscreen. In association with a powerful and robust soft PLC, the established Simatic WinCC flexible visualization system and its preconfigured user interface, it manages almost all injection molding tasks. Virtually any CNC programmer can handle the soft PLC, which is compatible with the Simatic S7-300 CNC. Systems integrator IIS has adapted the standard user interface to the exact requirements of the H&K machines and has implemented, for example, the control of three core pulls with potential for up to eight. Heating bands are connected with the I/O modules communicating via Profibus as an interface. The H&K machines were also augmented with a dynamic pressure controller, which had previously been lacking.

**Servo pump**

With its highly dynamic servo pump, Siemens offers the perfect start to optimizing hydraulic units.

• High energy efficiency: high effectiveness, optimum adaptation of force and speed to the pressing process

• Easy implementation: simple drive system, high level of functionality, savings in valve technology

• Less complicated: fewer components, modular construction

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<th>Old drive</th>
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Calculation based on measured energy data:
measurement time 30 min, cycle time 66 s, component weight 170 g, electricity price 0.15 €/kWh, operating hours 4,500/a

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