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

**A retrofit with IMH 3300 and Simatic increases reliability and delivers energy savings of more than 30 percent.**
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. ■