

## Resource efficiency through retrofitting

BIA reduces the energy consumption of older injection moulding machines by about 50 %



BIA currently operates a total of 43 injection moulding machines for 1-, 2- and 3-component technologies, most of which are from Sumitomo (SHI) Demag.

14001 since 2007. The long-term goal is now to achieve ISO 50001 certification for the energy management system. It is the declared philosophy of BIA to take account of the ecological consequences of all its processes and measures all the time. For example, attention is paid in the galvanising process to recovery and processing of rinsing water as well as the reusability of the resulting mono-sludges in the course of wastewater treatment. In this way, the use of nickel salts has been reduced by more than 30 %, and the use of chromium salts by more than 50 %.

Energy-efficient injection moulding is also possible with older hydraulic injection moulding machines, as proven by the example of BIA: The Solingen components supplier saves about € 12,000 in electricity costs annually simply because it has retrofitted four older hydraulic injection moulding machines from Sumitomo (SHI) Demag with the smartDrive variable-speed pump drive. It achieves a further 300 % energy saving by retrofitting sleeves for cylinder insulation.

ponent machines are available for injection moulding. All come from Sumitomo (SHI) Demag, with only a few exceptions.

Resource and energy efficiency is a major topic for BIA. The entire company is concerned with ecological aspects. For example, the environmental management system at BIA has been certified to ISO

Injection moulding is also subject to ecological considerations. For instance, the hall has been equipped with energy-efficient lighting. Scrap from production is recycled – and the material obtained is

“BIA is the surface,” observes Dr. Markus Dahlhaus, CEO of BIA Kunststoff- und Galvanotechnik GmbH & Co. KG. Today, starting from the surface, the company develops complete, galvanised plastic components – predominantly for the automotive industry. “Our strategy over recent years of situating ourselves in innovative areas of injection moulding and surface technology has proven to be correct,” says Dahlhaus. “Expertise in multi-component injection moulding and the night design processes that we have developed are in great demand on the market. In addition, there is a generally high demand for chromium-plated plastic parts.” We currently have four plastic galvanising systems in operation at Solingen. A total of 43 1-, 2- and 3-com-



Four machines from Sumitomo (SHI) Demag are now equipped with smartDrive – and are saving BIA lots of money. Sasa Grbesa (l.), deputy head of department for injection moulding at BIA, as well as Hans-Joachim Fuchs, service fitter at Sumitomo (SHI) Demag are delighted by this.

used for manufacturing shielding strips for the galvanising process. As a rule, new injection moulding machines are energy-efficient electrical ones.

“However, it was also important to us to make the older hydraulic machines more energy efficient – only we didn’t know how. There was no question of replacing the machines, after all they were running without problems,” says Thorsten Steffen, head of Mould Technology Development. Ultimately, he and his colleagues came up with the idea during a visit to the Sumitomo (SHI) Demag stand at the K 2010

show in Düsseldorf, when the sales employees of the injection moulding machine manufacturer drew their attention to the possibility of retrofitting machines with the variable-speed pump drive, smartDrive.

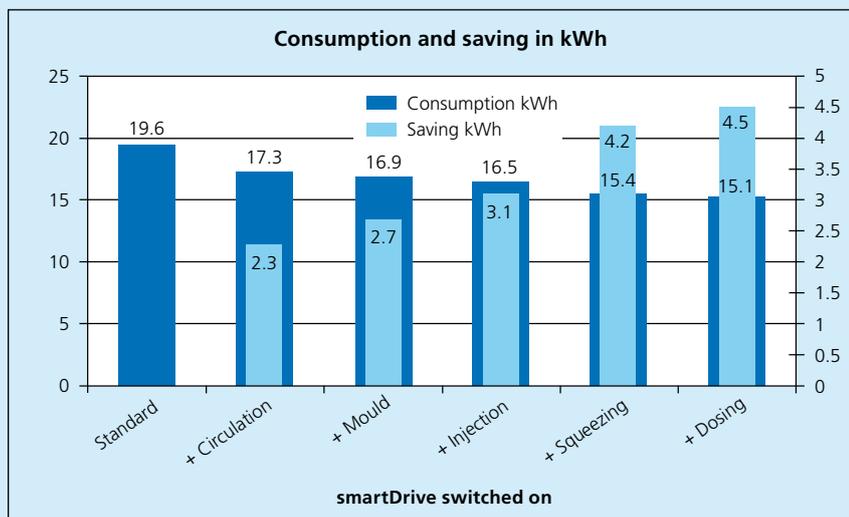
In smartDrive, a frequency inverter is installed before the asynchronous pump drive motor and is used for controlling the speed. The power of the pump drive motor can be adjusted dynamically for each individual phase of the cycle. According to the particular setting on the operable inverter controller, smartDrive

automatically adjusts the motor speed to the requirements of the particular cycle, and provides only the power that the machine actually needs in each cycle sequence.

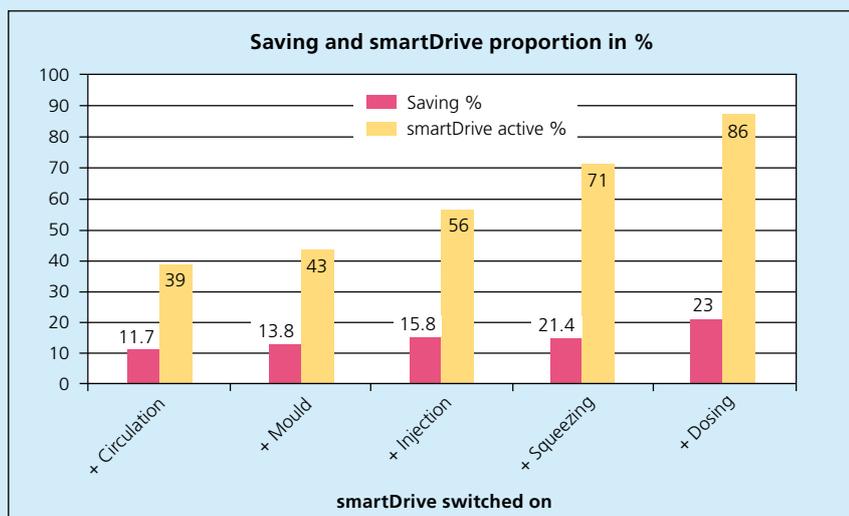
**Long cycle time means major savings potential**

The experts at Sumitomo (SHI) Demag quickly realised that smartDrive offers BIA major savings potential. After all, the components supplier has very long cycle times with long cooling phases during some of its injection moulding operations – phases during which smartDrive ensures that the pump drive is running at reduced speed, thus wasting little energy. “Any textbook would suggest much shorter cycle times for our components. However, galvanising means we face particular requirements in terms of injection moulding; the galvanising process is totally unforgiving with regard to surface defects resulting during injection moulding,” explains Dahlhaus. “We have observed that we reduce the level of scrap significantly with these long cycle times. This pays off for us twice over, because otherwise we would first galvanise many parts and then cast them aside after the 100 % quality check. This is just one of the reasons why the process is the most favourable one for us, including with regard to resource efficiency.” Moreover: An exceptional connection between the plastic and metal is required in the components – and this can only be achieved if the injection-moulded component has an optimum surface. As a result, BIA places great value on a long squeezing phase.

To be on the safe side, a service employee from Sumitomo (SHI) Demag came to Solingen before the project in order to measure the actual values on the machines. This EnergyCheck was conducted during operation on the largest machine, an Ergotech 650-3300 System built in 1997, in order to find out how much energy really could be saved. At the time, the machine was being used for producing trim strips using a family of moulds for the spoiler of the Mercedes-Benz GLK, with a cycle time of 55 seconds.



BIA saved 4.5 kWh per working hour on trim strips. The greatest savings resulted during squeezing and dosing for this component. The savings quota is thus 23 %. With an annual operating time of about 5,500 hours and an electricity price of € 0.12/kWh, this adds up to just under € 3,000 per year for this machine.



Evaluations at BIA show that smartDrive is principally active during squeezing and dosing: Namely 71 or 86 % respectively, all figures: Sumitomo (SHI) Demag



The proof of the pudding came in the EnergyCheck during production of these trim strips for the Mercedes-Benz GLK: How much energy would be saved by retrofitting the smartDrive? The calculations from Sumitomo (SHI) Demag indicated 20 %, whereas in reality it was 23 %.

It was agreed which parameters should be switched on in the smartDrive – and which should not. After all, each machine axis or each process phase can be switched on or off flexibly by the operator in the energy saving function of the smartDrive. For example, the injection phase can be carried out in standard mode during the injection moulding process, whereas the squeezing phase is performed in energy saving mode. The “high dynamics” function makes it possible to increase the speed of the pump drive dynamically in good time before a

machine axis actually starts. The displayed time values of the idle and active smartDrive phases, in relation to the entire cycle time, enable the operator to conduct a precise energy cycle analysis.

#### Individual adaptation of the smartDrive

smartDrive is switched on at BIA during squeezing as well as circulation pressure – with the result that the pump drive only operates at an extremely reduced speed during the long cooling time of about 30 seconds. “We can adapt the

smartDrive individually to our requirements, and this is done very conveniently using the machine’s NC4 controller. In addition, during production we can see exactly where we are saving electricity and when smartDrive is active,” says Sasa Grbesa, deputy head of department at BIA, with satisfaction.

The EnergyCheck delivered certainty: In the specific application, a saving potential of about 20 % of energy consumption could be achieved on the machine, corresponding to 3.73 kWh per working hour. “The calculations showed us in black and white that the purchase pays off for us. As a result, we did not hesitate to order the retrofit kit for initially one machine at first. And we have no regrets, because the measurements subsequently showed that we are saving even more electricity than originally thought,” says Grbesa.

#### Investment pays off within four years

In fact, BIA saved on average 4.5 kWh of power. The greatest savings resulted during squeezing and dosing for this component. The savings quota is thus 23 %. With an annual running time of about 5,500 hours and an electricity price of €0.12/kWh, this adds up to just under €3,000 per year for this machine. “To this extent, the investment in smartDrive will have paid for itself in just under four years,” says Dahlhaus.

After one year, it was clear to BIA: smartDrive helps to save energy and costs – without any reduction in the quality of the components. As a result, the company has since retrofitted smartDrive to three other older machines with clamping forces from 2,500 kN and up. BIA now



Sasa Grbesa with one of the chrome strips, standing in front of an Ergotech 650 system on which the components were produced.

#### Smart solution

In the variable-speed smartDrive pump drive, an optional inverter controls the pump motor speed according to the process requirements by “intelligent” evaluation of the pump signal. As a result, significantly less energy is consumed during the idle and part-load phases as well as during setup and adjustment phases. The process stability is assured in each phase of the process, because the necessary energy is provided.

makes sure that new machines from Sumitomo (SHI) Demag come factory-fitted with the comparable technology, activeDrive.

“smartDrive contributes to a further reduction in energy consumption per square metre of manufactured surface – which is the yardstick we use,” says Dahlhaus. A welcome side effect for BIA, also in line with resource efficiency, is that the smartDrive package can be removed from one machine and used for other machines. For example, BIA had this fitted to one machine from 1997. “When the time comes for us to pension-off this machine, we can use the smartDrive for other machines,” says Grbesa.

BIA is reducing the energy consumption of its older machines even further using cylinder insulating sleeves. These reduce energy losses due to heat radiation from the plasticising cylinder. The insulating sleeves are simply mounted under the standard guard plate of the plasticising cylinder, and are adapted to its heating zones. If the process requires it, BIA can remove the insulation from individual zones at any time.

“With the insulating sleeves, we achieve a further energy saving of about 30 %,” says Grbesa. Dahlhaus adds: “As a result,

### Detailed EnergyCheck

Using the EnergyCheck service offered by Sumitomo (SHI) Demag, it is possible to measure the energy consumption of an injection moulding process and its cycle phases before making a decision about smartDrive. The result for the user is information regarding the actual energy consumption for its individual production parts. Furthermore, the user can obtain results in advance regarding how much energy would be saved by installing the variable-speed pump drive.

this investment pays off within only a few months. In addition, it means the machines are ready to operate much faster on a Monday morning – which means we can start production earlier. Furthermore, we now no longer heat up the hall

so much, so we have greater control over the heating energy.” This comparatively simple measure has such a great effect that BIA is already operating half of all its machines from Sumitomo (SHI) Demag with cylinder insulating sleeves. ■

### Support & Engineering

smartDrive was developed in the Support & Engineering department of Sumitomo (SHI) Demag. This area, part of customer service, is concerned with handling or producing retrofits for existing machines and robots, providing technical support for special customer requirements and developing new retrofit solutions. The Support & Engineering department comprises two teams, one focussing on hydraulic machines and the other on electric ones. Retrofit solutions can be directly produced and developed for specific customers thanks to many years of experience and expertise, including in the software field. This offers the opportunity of responding quickly and flexibly to customers’ wishes, even when it comes to older machines.