

INJECT

Sumitomo (SHI) Demag – Magazine 01/2012

Fitness cure for injection moulding machines:

How the smartDrive pump drive increases energy efficiency

Better process consistency:

How the activeLock non-return valve ensures greater precision

Insert moulding of corrugated tubes:

How Maincor extrusion and injection moulding work in automatic sync

14 years of production in China:

What will ensure the success of the expanded Systec C machine series from Ningbo

CUSTOMER DAY Production Efficiency 24 May 2012 in Schwaig



Dear Readers,

After more than four years under the same roof, at the end of 2011, Sumitomo Heavy Industries (SHI) brought together its German and Japanese ranges of injection moulding machines under the banner "Sumitomo (SHI) Demag". This joint brand symbolises the best of both worlds by combining the strengths of Japanese and German engineering to create a complete portfolio of all-electric, hybrid and hydraulic injection moulding machinery.

We have been using our logo in Europe since 2008. It combines the traditional symbol of Sumitomo Heavy Industries with the Sumitomo and Demag brands. This logo symbolises the special benefits offered to you by Sumitomo and Demag, and now it is also provides the global corporate identity for Sumitomo Heavy Industries.



For the whole of last year, the focus of all our events and publications was on production efficiency in the injection moulding area. Production efficiency is a broad term that includes production output, availability, energy efficiency and durability. We never take our eyes off the goal of providing you, our customers, with ever-greater efficiency. In this edition of INJECT you can read how the SmartDrive retro-fit drive concept (page 4) and the activeLock lockable non-return valve (page 8) can actively increase the production efficiency of your injection moulding machine.

We will be showing these and other products at our "Production Efficiency Customer Day" on 24th May in Schwaig. I very much look forward to seeing you there.

With best wishes,

A handwritten signature in blue ink, appearing to read "T. Okamura".

Dr. Tetsuya Okamura
Senior Vice President, Sumitomo Heavy Industries (SHI) Ltd. Japan
CEO, Sumitomo (SHI) Demag Plastics Machinery GmbH

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Dr. Tetsuya Okamura appointed Head of Sumitomo Heavy Industries' (SHI) Global Plastics Machinery Business

Dr. Tetsuya Okamura has been appointed Senior Vice President of Sumitomo Heavy Industries (SHI) Ltd., Japan, with effect from 01 April 2012. He therewith assumes responsibility, in addition to his current role as CEO of Sumitomo (SHI) Demag Plastics Machinery GmbH in Schwaig, overall responsibility for the Plastic Machines Division of the Japanese parent company, Sumitomo Heavy Industries (SHI).

In his extended role, Dr. Okamura will be responsible for the consolidation, further

development and expansion of worldwide business in injection moulding machines within the SHI Group. Dr. Okamura has already held the roles of Managing Director and CEO of Sumitomo (SHI) Demag Plastics Machinery GmbH since 2008. He will continue to be supported by COO Shaun Dean in managing this.

Parallel to Dr. Okamura's appointment in Germany, from 01 April 2012, Kazuo Hiraoka will take charge of the production of SHI plastic machines in Japan as the

Head of Plastics Machinery Division. The current Head of Plastics Machinery Division, Yuji Takaishi, will assume the position of Head of Corporate Planning and Development Group in the parent company, Sumitomo Heavy Industries, from 01 April 2012. ■

Dr. Okamura, Senior Vice President of Sumitomo Heavy Industries (SHI) Ltd., Japan



Success in Slovenia is to be expanded

Following its latest successful sales campaign in Slovenia, Sumitomo (SHI) Demag now intends to expand its sales operations throughout the entire territory of the former Yugoslavia. Since the Slovenian sales and distribution specialist for injection moulding machines, Top Teh, officially took over the representation of Sumitomo (SHI) Demag for the state with its two mil-

lion inhabitants in January 2009, it has chalked up an impressive increase in order intakes. This means that Sumitomo (SHI) Demag has now come to have a market share of around 25 per cent and has accordingly taken a large step towards becoming the market leader in Slovenia. With this strong mainstay, Sumitomo (SHI) Demag and Top Teh now wish to expand

their distribution activities throughout the entire territory of the former Yugoslavia – to Serbia, Croatia, Bosnia-Herzegovina, Montenegro and Macedonia (FYROM). The next important step in this direction will be taking part in the Sajam Tehnike – International Fair of Technique and Technical Achievements (UFI) from 14 to 18 May 2012 in Belgrade. ■



Informed about automation solutions (from left): General Manager, Business Unit Sales & After Sales, Christian Renners, COO Shaun Dean, both from Sumitomo (SHI) Demag, Arthur Schwab and Rainer Knaak, both from the management team at M.A.i.

An informative day on automation in Kronach

Experts in automation M.A.i GmbH & Co. KG and Sumitomo (SHI) Demag extended invitations to attend a one-day conference on 01 March 2012 in Kronach on the subject of "Opportunities for increasing quality and reducing costs through automation". With 150 delegates attending, the information day on automation attracted an extraordinary number of

visitors. The visitors received comprehensive information on the subject of production solutions in several presentations. Speakers included representatives of the Franken Plastics Network as well as from M.A.i and Sumitomo (SHI) Demag. Thomas Schnauffer from Sumitomo (SHI) Demag's Customer Engineering, for example, outlined the company's performance

range and introduced projects currently being conducted jointly with M.A.i. The showroom of M.A.i GmbH in Kronach was the venue for a Systec multi 210 with a 2,100 kN clamping force with multi-component application and an all-electric IntElect 50 with 500 kN clamping force to demonstrate their performance capabilities. The visitors were also able to take a look behind the scenes at M.A.i by taking part in a guided works tour. The company, with its 135 employees, has been developing and providing automation solutions in the areas of plastics technology, assembly technology and special applications for over ten years now. ■

Fitness cure for injection moulding machines

Speed-regulated smartDrive pump drive increases energy efficiency

The energy efficiency of hydraulic injection moulding machines can also still be increased considerably. With its smartDrive speed-regulated pump drive, Sumitomo (SHI) Demag offers its customers a retrofitting design promising optimum levels of effectiveness and savings in energy of up to 40 %. The dynamic performance adjustment of the pump drive motor, allowing for the individual adjustment of every cycle phase, also helps contribute to this.

Sumitomo (SHI) Demag integrates smartDrive operation into hydraulic injection moulding machines in the Ergotech series within the context of its retrofit programme. This retrofitting is the simplest way to achieve considerably lower energy consumption and thereby greater cost-effectiveness. All that is needed is clamping a frequency converter in front of the asynchronous pump drive motor

thus regulating its speed. The alternative use of a dynamic servomotor and of a fixed displacement pump requires considerably higher investment costs.

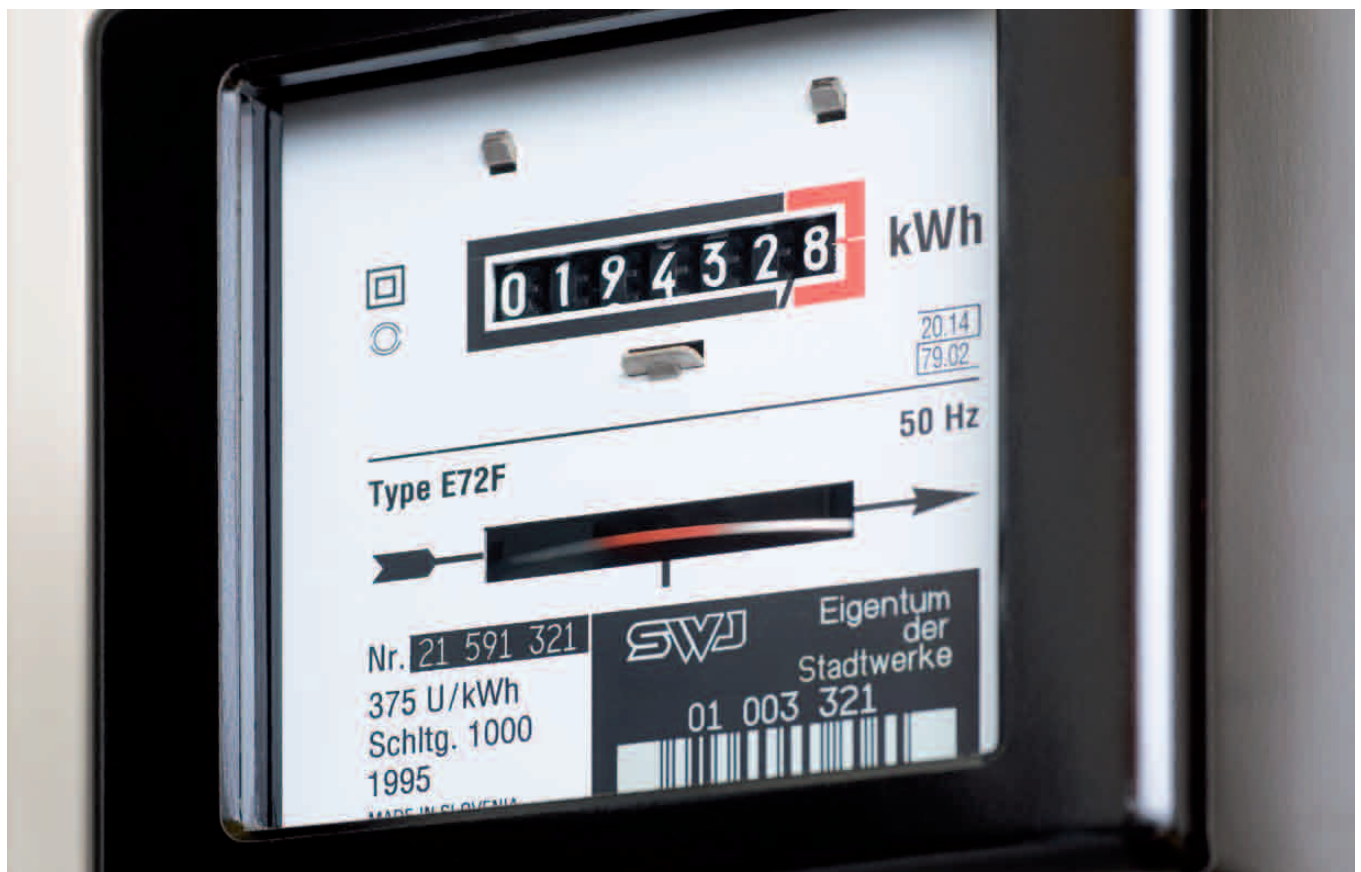
Frequency converter can be adjusted to each processing phase

The functions of the smartDrive can be operated via the NC4-control of the machine. The machine is switched from standard operating to energy-saving mode by operating a soft switch. Every machine axis and every process phase can then be integrated or switched out of the smartDrive energy saving function separately. During the injection moulding process, for example, the injection phase can be operated in standard mode, but the hold pressure phase can be operated in energy-saving mode. The "High Dynamics" function leads to the dynamic speed of the pump drive being

increased in ample before a machine axis actually starts up. The time readings displayed for at-rest and active smartDrive phases, referenced to the overall cycle time, allow the operator to obtain a precise energy analysis for the cycle.

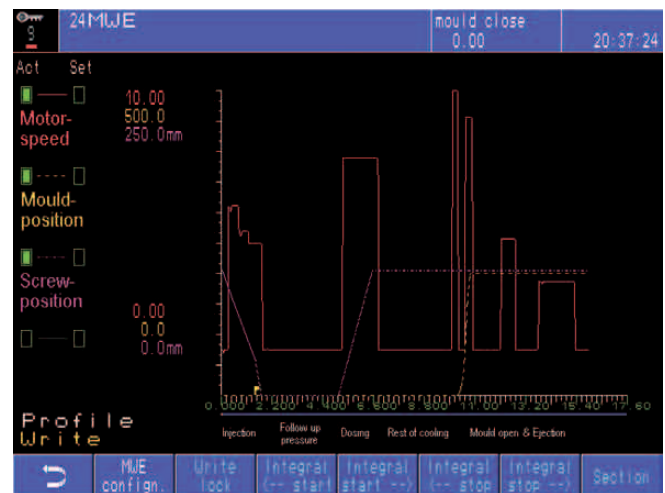
As the user can flexibly allocate the energy saving function to the individual machine axes and process phases and does not have to let the entire cycle be affected, the smartDrive solution wins out over frequency converters working according to other designs.

In the case of various machine functions, the converter would react too slowly, which could have negative effects on the cycle time, process reliability or product quality. If certain production orders are to be executed in non-energy saving mode, this can also be done without any restriction.





This dynamic coordination at all phases of the injection moulding cycle means that the smartDrive pump can achieve optimum effectiveness levels with minimum losses.



In line with the respective setting, smartDrive automatically matches the motor speed to the requirements of the cycle and maintains just the performance required for each sequence.

Saving potential of up to 40 %

Energy saving potential with smartDrive is considerable. In an automotive use with a cycle time of 61 seconds, for example, 18 % in energy savings could be made in relation to the overall consumption by the motor. Savings of even 26 % are possible in consumer production at a cycle of 30 seconds.

The differences are based on the strong dependability on the cycle or process. At very high pressures, therefore, the speed cannot be reduced in the phase concerned. Saving potential is consequently lower. Cycles of 15 seconds and upwards usually offer adequate savings potential to justify fitting the smartDrive system. Based upon experience gained by Sumitomo (SHI) Demag, possible energy savings vary between 15 and 40 %.

Using the EnergyCheck service offered by Sumitomo (SHI) Demag enables the energy consumption of an injection moulding process and its cycle phases to be measured prior to any decision being made in favour of smartDrive. The outcome of the check provides the user with detailed information about the actual energy consumed during individual production stages. This means the amount of energy installing the speed-regulated pump drive will save can be calculated beforehand.

Tried and tested in tough practical conditions

The smartDrive system has in the meantime been tried and tested to great effect by many users in demanding practical conditions. An example of this is provided by Mann + Humpel in Ludwigsburg, development partners and serial suppliers to the international automobile and engine construction industry. The manufacturer, which focuses on filtering systems, operates, among other systems, an Ergotech 500 system injection moulding machine, with 5,000 kN clamping force and equipped with NC4 controls.

The company had a smartDrive installed in their machine as part of a project aimed at reducing CO₂ emissions. Dr. Alrun Spennemann, Project Manager in Mann+Hummel's Management Team for Injection Moulding and Welding, is very happy with the outcomes of the modernisation measure: "The retrofitting has worked well. Sumitomo (SHI)

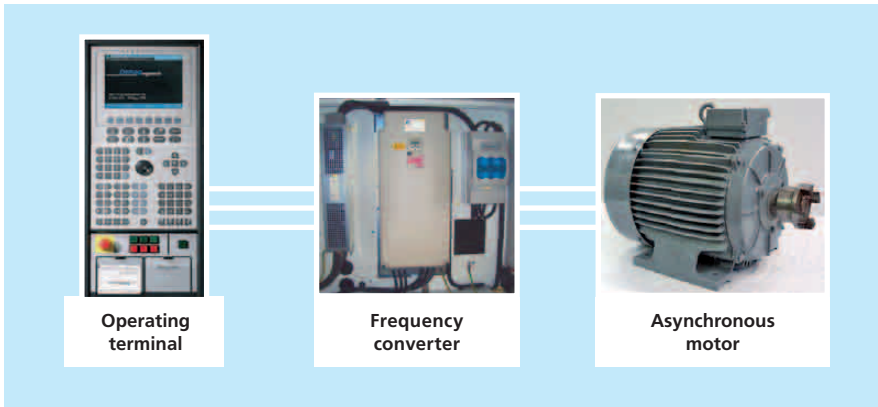
Demag completely retrofitted the injection moulding machine within one day. This dynamic performance adjustment enabled us to reduce energy consumption in the motor by 18 per cent on one of our continuous runs. We are very satisfied with the solution and have therefore already had a second Ergotech, with an 8,000 kN clamping force, retrofitted.

A pioneering solution

With an eye to the future, operators benefit from the fact that Sumitomo (SHI) Demag install the frequency converter in an external switch cabinet when carrying out the retrofit. This means that the switch cabinet and the converter can be re-used on the next model, once it no longer makes economic sense to extend the period of use of a machine. Against this background, it can make economic sense to retrofit older machines as well, even if no full amortisation of the investment can be expected due to the probably short remaining operating time of this machine. Government-funded

Production efficiency
activePlus

Learn more about our "13 technology components" for production efficiency at:
www.sumitomo-shi-demag.eu/products/production_efficiency



The retrofitting of hydraulic injection moulding machines in the Ergotech series with smartDrive propulsion is the simplest way of achieving considerably lower energy consumption and thus greater cost-effectiveness.

support programmes can also be accessed to provide investments in energy efficiency. With smartDrive, Sumitomo (SHI) Demag can dampen the cost increases which have been incurred by its customers through the doubling of energy prices in the last ten years. Moreover, smartDrive takes full account of growing environmental awareness within society. There are also advantages for the employees involved in production, as they benefit from the reduction in noise made by the machines with which the speed-regulated pump drive is equipped.

Sumitomo (SHI) Demag has been making a considerable contribution to energy saving for years already and to economical production means through its continuous further development of its injection moulding machines. This commit-

ment, which has been proven by numerous evolutionary steps, includes the all-electric drive for dosing units, the hydro-mechanical closure system of the El-Exis hybrid injection moulding machine, which operates with a combination of electric and hydraulic drives, as well as the re-cycling of braking energy and the deployment of energy-efficient regulating pumps.

Supplementary measures against overly high electricity consumption

Further precautions to help reduce electricity consumption can be taken during a retrofit. Reduced electricity load peaks can especially be cited as an example of this. To this can be added the insulation of the cylinder heating, a power factor correction and lower electricity load during oil preheating. In addition, it is

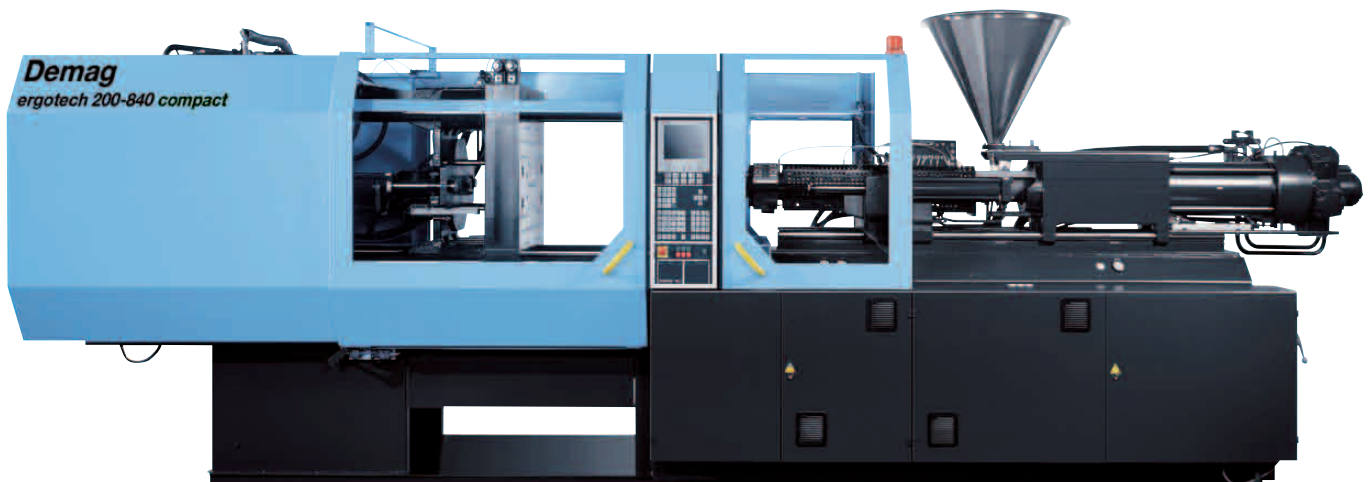
also possible to warm up with a shorter switching on period, to reduce in two stages after a cycle interruption during automatic operation and to install an interface for an external current load monitoring device.

Both Sumitomo (SHI) Demag's hybrid and hydraulic machines also help to contribute towards cost-effective injection moulding, as they can both be configured in an optimum way. This means the processors are in a position to show their production requirements even more precisely and to achieve the best possible price-performance ratio. ■

Author

Werner Gempel
Sumitomo (SHI) Demag
Trainer in Schwaig

The retrofitting of hydraulic injection moulding machines in the Ergotech series with smartDrive propulsion is the simplest way of achieving considerably lower energy consumption and thus greater cost-effectiveness.



Genius 2.0 Systec: Injection moulding calculation slider now also on-line

Important information for rapid retrofitting and fitting Systec machines

The "injection moulding calculation slider" has been a popular aid when setting injection moulding machines for decades. Designed in the 1970s, continuously improved and updated again and again, it is still in use in many injection moulding businesses whenever machines need to be retrofitted with a new tool.

A lot has happened in the last few years – machines, tools, processes and materials have all undergone further development. Which is why the calculation slider is now available in a new edition – as the Genius 2.0 Systec. Staff in Sumitomo (SHI) Demag's Processing and Application Technology Division in Schwaig and Wiehe have collected the data for the popular device used to accompany practical operations. The first edition Genius 2.0 Systec lists some injection units of Systec machines with their pro-

perties and makes it easier to process the selection of the correct unit for the specific production task in hand.

The new handy calculation slider helps with the basic setting of Systec injection moulding machines. It takes account of the properties and requirements of the plastic to be processed as well as the part geometry and provides recommendations for all important process parameters to be set – for drying conditions, for processing temperatures and dosing setting, for the injection and hold pressure set-up, for the remaining cooling periods and the required clamping force.

Depending on the characteristics of the part, the Genius calculates the cycle times to be expected, such as injection, hold pressure, remaining cooling, mould and periphery periods and even calculates possible speeds, dosing times,

stroke loads and pause periods. Despite having an extensive database and many recommendations, the Genius does not replace any form of process optimisation based on the machine controls. If you know the mould to be retrofitted, you already usually have the optimum process data. But: If you are fixing a previously unknown mould or testing a new material for the first time and starting to set up the machine, you will be provided with valuable setting data, within a short space of time, by the Genius.

The Genius, made of rigid film in its well-known DIN long form, fits into every pocket. The 2.0 Systec version for the Systec standard machine is already available in German, English, Russian and Polish. A PC-ready off-line version is also available in German, English and Russian. ■



You do not yet have a Genius 2.0 Systec?

We are happy to send you a calculation slider or a USB stick containing the off-line version. Please contact your nearest distributor or send us an email to info-dpde@dpg.com.

Better process consistency in precision moulding

Switchable activeLock non-return valve can be relied upon to prevent melt back flow

The fact that the closure behaviour of traditional non-return valves cannot be directly influenced represents a potential weak spot in the injection moulding of high-precision components on all-electric machines. Sumitomo (SHI) Demag has now resolved this problem with its activeLock switchable non-return valve, a unique development on the European market.

When transferring the melt from the plastification unit to the injection moulding mould, the non-return valve acts as a separation element between the screw and the space in front of the screw, ensuring that no melt flows back into the screw channels during the injection phase. Two designs have been developed for dealing with this in the past few decades: the ring non-return valve (Fig. 1) as the most usual type of construction as well as ball-type non-return valves. Both operate on the basis of the same underlying principle: during dosing, the melt is moved forwards by the rotation of the screw and enters the space in front of the screw through the open melt channels of the non-return valve. Only when the injection phase has begun does pressure build up in the space in front of the screw, which pushes the non-return element, that is say the ring or ball, against an end-stop and thus seals the antechamber against the screw space.

Traditional systems conceal imprecisions

It is precisely here that the weak spot of the design is to be found. This is due to the fact that the non-return valve is open at the beginning of the injection phase and melt is still flowing back into the screw channels until it is completely closed. This leakage flow would not present any problem if the closure processes were always to operate in the same way. There are, however, numerous factors affecting the closure behaviour of the



Fig. 1: In the case of traditional ring non-return valves, the closing behaviour depends on the most varied process parameters and cannot be actively influenced.

non-return valve and which thus have a direct effect on the reproducibility of the process. Uneven melt viscosities occur, for example, due to variances in the temperatures or batches of the material. In addition, the surrounding temperature as well as residual moisture values of the thermoplastic also play a role. Even deviations of temperature of the mould or hot runner can change the development of the counter-pressure in the space in front of the screw and thus lead to a closure behaviour of the non-return valve which cannot be reproduced.

An undefined closing of the non-return valve always expresses itself directly in

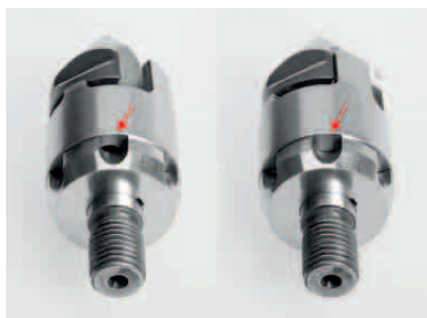


Fig. 2: The activeLock switchable non-return valve in the open (left) and closed (right) state.

the reproducibility of the shot weight and therewith in the quality of the parts. An opportunity to improve the closure behaviour of traditional systems is provided by the use of a decompression stroke at the end of the dosing procedure. The melt pressure within the space in front of the screw can be reduced by the screw retracting and bringing the ring of the non-return valve into a defined position. A disadvantage of this procedure is the danger of blistering and burnt streaks occurring if air is drawn in due to the resulting low pressure. A further procedure which is frequently used in practice is the quickest possible closing of the non-return valve through increased injection speed. Limiting factors in this strategy are, on the one hand, the melt viscosity and, on the other hand, the part geometry and possible surface errors on the manufactured parts.

All of these approaches do not deal with the basic problem: the closing of the ring- and ball-shaped non-return valves as a passive procedure, which can only indirectly be influenced by the use of a decompression stroke or through the selection of the injection speed.

Precision parts require a defined closing behaviour

Measured according to the precision of the injection moulding machine overall system, the imprecisions arising in the melt cushion only have an insignificant effect on the part quality in the majority of uses of injection moulding. For components, however, for which a very high level of precision and process consistency is important, the undefined closing behaviour of traditional non-return valves represents a weak spot. Such precision articles, which are especially required in the electronics industry and medical engineering, are manufactured using moulds working with high precision on all-electric injection moulding machines so as

to be able to adhere to the narrowest tolerances in terms of dimensions and weights. In an overall system which is so geared towards accuracy, the non-return valve creates a gap in precision, which Sumitomo (SHI) Demag is now closing with a development which is innovative and unique for the European market.

Switchable lock ensures reliable sealing

For precision injection moulding on all-electric injection moulding machines, the machine manufacturer has offered a switchable non-return valve since K 2010, which closes in an active and focused manner and which thus seals the space in front of the screw in a way which can be reproduced. Sumitomo (SHI) Demag is marketing the design under the activeLock brand. The principle of the newly developed switchable non-return valve distinguishes it crucially from traditional ring or wheel-like non-return valves. The crucial factor is that activeLock already locks at the close of the dosing procedure and thus ensures a locked space in front of the screw during the entire injection phase and therefore at the commencement of injection as well.

The activeLock from Sumitomo (SHI) Demag has a rotatable lock ring, which is closed through a counter-rotational movement of the screw (Fig. 2). During the plastification, the activeLock is open due to the rotation of the screw and the melt

flows through the free channels into the space in front of the screw. After the dosing, the screw turns in the opposite direction and completely and reliably locks the melt channels of the non-return valve through the rotating movement. This procedure takes place independently of other process steps and is therefore free of typical process fluctuations. The defined locking movement ensures in this way an absolutely consistent closing behaviour of the non-return valve, which can be actively influenced, and thus a considerable increase in processing consistency.

The fact that activeLock actually closes completely prior to the beginning of injection is made clear by the pressure ratios shown in Fig. 3, which were measured behind the non-return valve (conventional and activeLock compared) during injection. The pressure peak during injection behind a standard non-return valve shows a melt back flow. When activeLock is used, in contrast, no increase in pressure is detected.

Mature technology from Japan

A major advantage is that the technology of the non-return valve which can be closed through rotation has already been patented by the Japanese parent company, Sumitomo, for some years. Since then, several thousands of switchable non-return valves have been in use on all-electric Sumitomo (SHI) Demag ma-

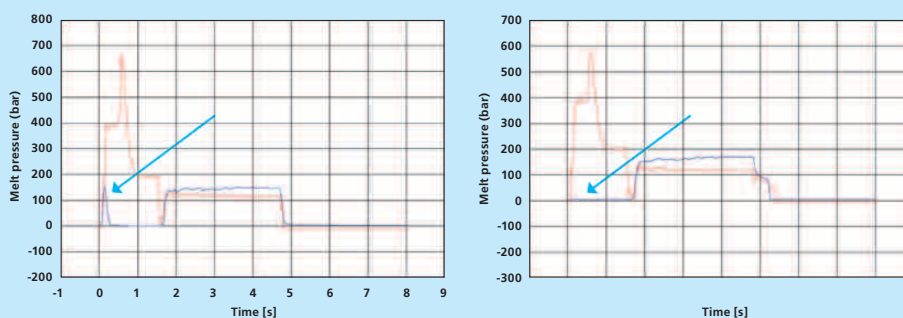
chines in Asia and in the USA. Sumitomo (SHI) Demag's European customers therefore benefit from the great wealth of experience already gained in this area.

Since the European launch at the K 2010, immense success has also been achieved in this field as well. In addition to the switchable non-return valves which are now on the market and easily number a hundred, a series of German field test customers, such as Wago, Tyco, Dehn + Söhne as well as Fischer, had already been working successfully with the technology, which is unique on the European market, even before sales had officially begun.

Processing reliability of electric machines increased

Fischer GmbH & Co. KG, Sinsheim, a long-established and loyal customer of Sumitomo (SHI) Demag, for example, ranks among the first users of activeLock from the outset. The injection moulder, which specialises in processing connector systems, has been working with all-electric machines since 2004 and today operates 18 IntElect machines. Robin Kemter, who is responsible for project management / process optimisation at Fischer, reported in a presentation at Fakuma in autumn 2011 that his company had been able to improve their process reliability, which was already considerably improved with the all-electric machines, even further through using activeLock. Higher reproducibility, improved parts quality, lower reject share, more reserves in selecting process parameters and larger process windows as well as reduced dependencies on temperature and viscosity values register the key results for Fischer. By way of example, Robin Kemter demonstrated the results achieved in manufacturing a two-pin contact safety device (Fig. 4) made of PBT GF20: the light parts, weighing 0.62 g, were manufactured in a 16 cavity mould with four cavity hot runner on an IntElect 50 (500 kN clamping force, screw diameter 25 mm), both with a traditional ring non-return valve and also with the activeLock version. In the course of 600

Fig. 3: The pressure peak during injection behind the standard non-return valve displays a melt back flow (left). When activeLock is used, in contrast, no increase in pressure is detected (right).



Material: PA 6.6
 Red line: Injection and dynamic pressure
 Blue line: Pressure on the additional pressure sensor behind the non-return valve

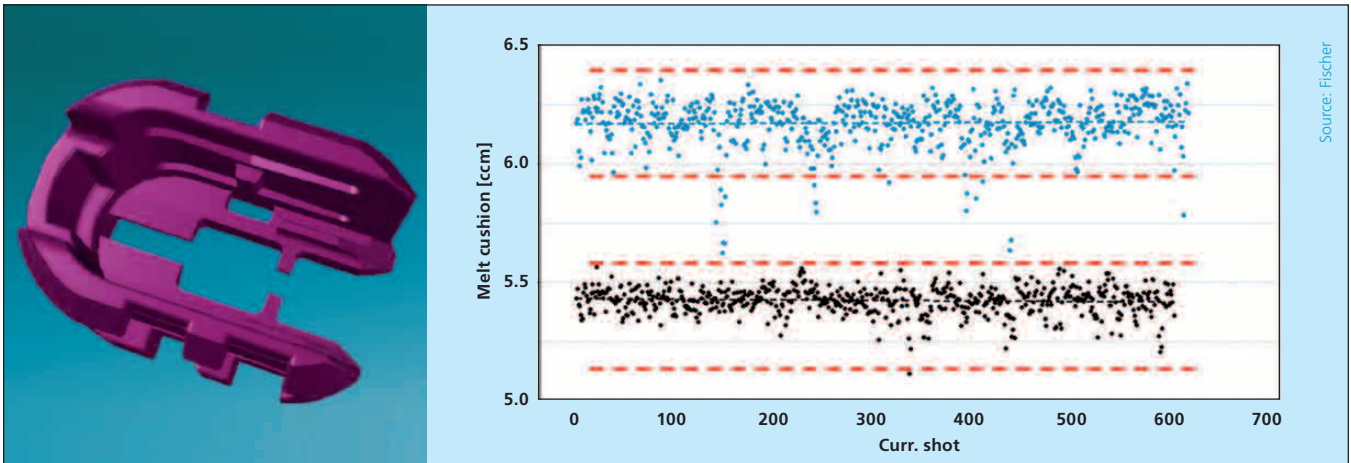


Fig. 4 and 5: This two-pin contact safety device was manufactured using both a traditional ring non-return valve and activeLock. In this process, the switchable non-return valve reduces the residual melt cushion and also ensures adherence to narrower marginal values.

shots, the scatter plot shows 18 cycles in the case of the standard non-return valve outside the melt cushion tolerance zone (Fig. 5). Such runaways could be avoided entirely with activeLock.

Deviations for parts weight cut in half

Reliability is crucial for Dehn + Söhne GmbH und Co. KG, Neumarkt, both in terms of manufactured products and also processing. The family-owned company focuses on the three applications of surge protection, lightning protection/earthing and occupational safety in its product range. Within the context of the activeLock field test, Dehn used, among other things, an IntElect 50-110 (500 kN clamping force, screw diameter 25 mm) to manufacture a precision component installed in the surge protector made of PA66 with a parts weight of 1.2 g in the eight cavity hot runner mould. Compared to the ring non-return valve, the deviations from the target parts weight in the activeLock were contained within a considerably narrower range. The values were established both for the individual cavities as well as in the means with a batch load of 100,000 items (Fig. 6). On average, the activeLock halved the number of deviations.

According to the experiences gained to date, activeLock was able to cut melt cushion fluctuations by up to 50 % (Tab. 1 and 2). In addition, the defined closing in the cavities brings about pressure

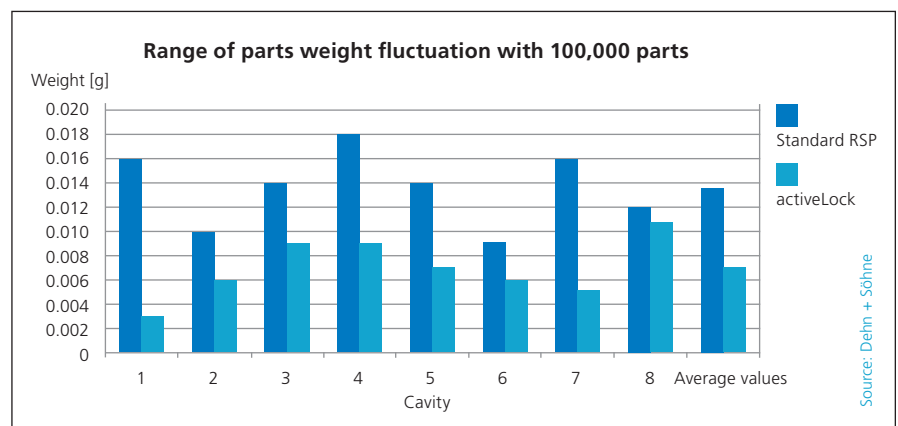
ratios which can be reproduced, which in turn reduce fluctuations in sealing, crystallinity and warpage and thus increase the level of dimensional accuracy. Sumitomo (SHI) Demag is focusing with its innovation on precision injection moulding with technical thermoplastics such as PA, PBT, PEEK, PEI as well as LCP materials – that is to say, materials which have extremely low viscosity in the melt and which due to their high price level demand minimal rejection rates for economic reasons alone.

The largest benefits in terms of technical procedure are provided by activeLock in applications with small screw diameters and low screw strokes. Fig. 8 shows that the negative influence of the switching cycle of standard non-return valves declines with increasing screw diameter.

Operating small injection stroke processes reliably

In addition, the injection stroke plays a large role: the smaller the injection stroke, the larger is the negative influence of the switching cycle of traditional non-return valves. If, on the other hand, the work is carried out using activeLock, even the smallest injection strokes can be operated in a reliable processing manner far below 1D. This allows for considerably higher flexibility in the use of injection moulding machines. This means the smallest parts can be manufactured with high-precision using electric standard injection moulding machines. A further important aspect: using standard plasticifications means that employing cost-intensive micro-granulates can be dispensed with.

Fig. 6: In the manufacturing of a precision component installed in the surge protector, the parts weight deviates with activeLock considerably less from the target than is the case with a traditional non-return valve.



Non-return valve	Shot weight			Melt cushion	
	Absolute [g]	Distribution [g]	Distribution [%]	Absolute [cm ³]	Distribution [cm ³]
Standard	42.094	0.037	0.09	6.485	0.190
Switchable	42.035	0.017	0.04	4.719	0.087
Change from standard [%]		-54			-54

Tab. 1 and Fig. 7: In the case of manufacturing the eight cavity plug housing, activeLock improves the consistency of the shot weight and of the residual melt cushion.

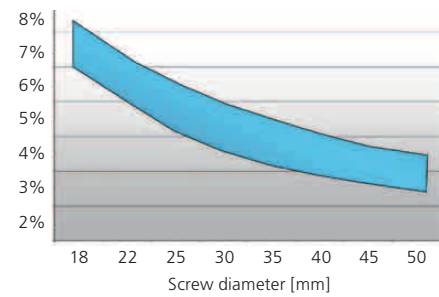
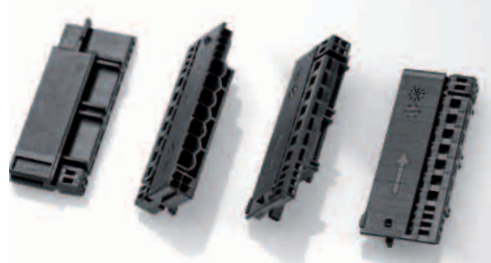


Fig. 8: Stroke of the locking ring of a ring non-return valve in relation to the usual screw stroke (presuming usual injection stroke values): with increasing screw diameter, the influence of the switching cycle declines.

Micro-injection with standard injection moulding machines has been mastered by the company of Stamm AG, Hallau/Switzerland for many years now. The Swiss processor, renowned for their micro specialities, uses an IntElect 50-45 (500 kN clamping force, screw diameter 14 mm) to produce light planetary carriers weighing 0.055 g made of POM (Fig. 9) in the four cavity mould. Stamm also makes use of the advantages of the new activeLock and used these to improve the parts weight consistency by a good 50 % in comparison with the standard non-return valve in the use of planetary carriers (Tab. 2).

Can be changed at any time and simple to operate

Following a one-year field test, Sumitomo (SHI) Demag launched the activeLock for

the all-electric IntElect machines at the K 2010 and since then has offered this for all screws in the diameter range of 14 to 35 mm. As activeLock has identical installation dimensions and connection threads to Sumitomo (SHI) Demag's standard non-return valves, retrofitting them can usually be done without any problem at all. In the NC5 control, an additional screen in display mode ensures user-friendly operation (Fig. 10). Sumitomo (SHI) Demag has devised simple basic rules in numerous technical processing tests for establishing the three variables of rotation angle, rotation speed and the point in time of the closing procedure.

The technology of a non-return valve which can be switched through a backward screw rotation is patent-protected by Sumitomo. There is no other manufacturer offering such a non-return valve

on the European market. This means customers of Sumitomo (SHI) Demag have a solution for improving processing precision and reproducibility uniquely available to them.

In order to exhaust fully the potentials for precision and efficiency with all-electric injection moulding machines, Sumitomo (SHI) Demag has also developed a series of further active components in addition to the switchable non-return valve. Using activeDynamics, for example, means that extremely short scanning times of the axis controllers can be achieved through motors, frequency converters and machine controls which are perfectly aligned with each other and which can thus themselves compensate for complex injection profiles precisely and in ways which can be reproduced. The new activeFlowBalance function provides a balancing in melt pressures when using multi-cavity moulds through active stopping of the screw during the transition from injection to hold pressure, which helps to improve the quality of the parts. ■

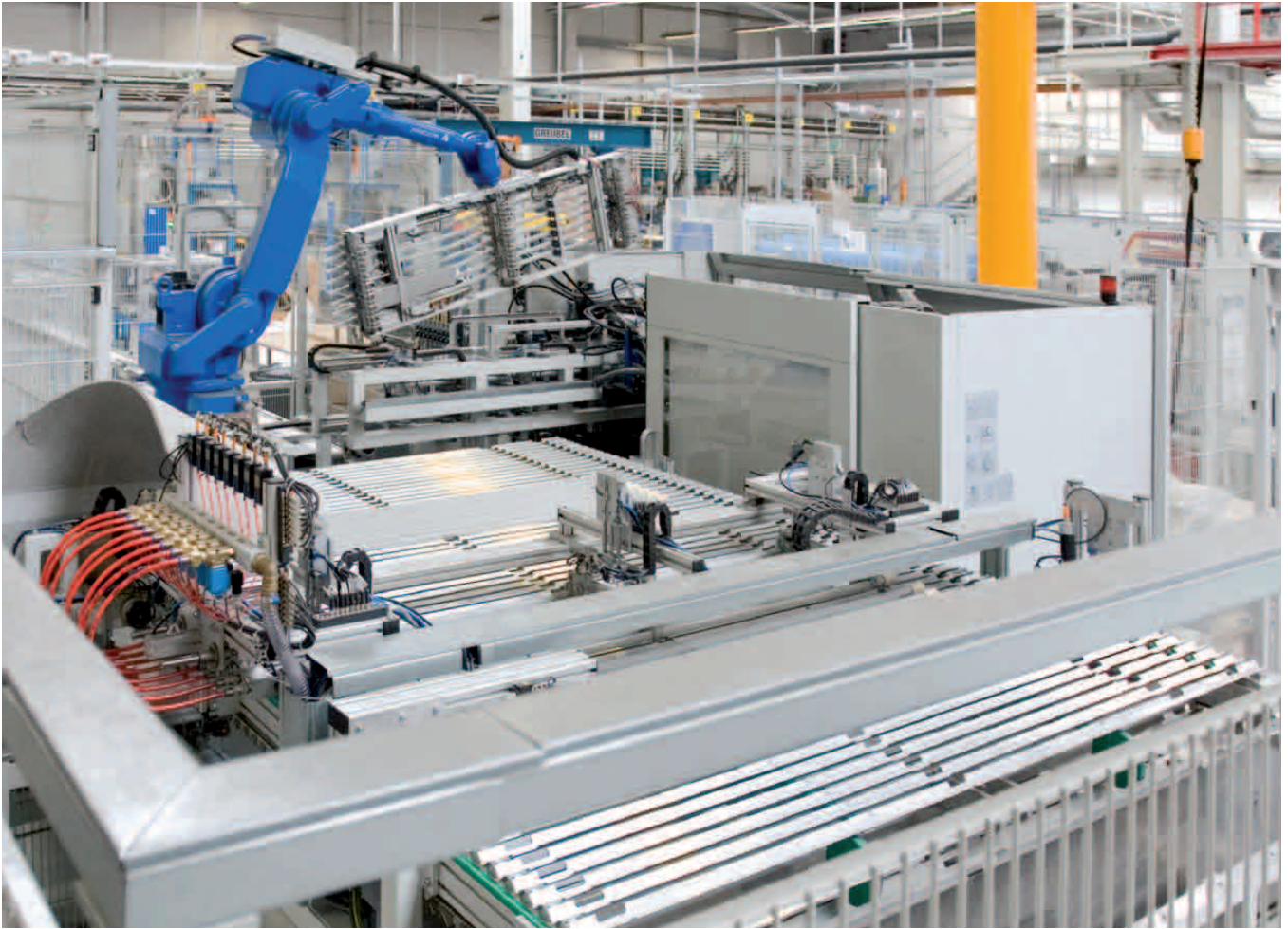
Authors

Thomas Brettlich, Dipl.-Ing. (FH)
 Director of Technological Development
 Simon Geltinger, Dipl.-Ing. (FH)
 Technological development in plastification

Non-return valve	Parts weight (4 cavities)		
	Absolute [g]	Distribution [g]	Standard deviation [g]
Standard	0.0552	0.0016	0.000461
activeLock	0.0556	0.0011	0.000218
Change to standard NRV in %		-31.3	-52.7

Tab. 2 and Fig. 9: In the micro-application planetary carriers as well, the switchable non-return valve also clearly improves the weight consistency.





Extrusion and injection moulding in sync

Fully automated machinery for insert moulding of corrugated tubes at Maincor

A visit to the Maincor works in Knetzgau reveals a technological rarity: one of the few in-line operational combinations of extrusion and injection moulding put into production anywhere in the world. This is where all the escape hoses of the latest generation of dishwashers are produced, fully automatically, for Germany's largest manufacturer of household devices. Synchronising an injection moulding process in time with continuous extrusion is considered a particular challenge.

Maincor has mastered the problem jointly with its machinery suppliers under the direction of Sumitomo (SHI) Demag Plastics Machinery GmbH, Schwaig. The results of this achievement through the partnership of the injection moulding machine constructor, the automation

specialist M.A.i. GmbH & Co. KG, Kronach-Neuses, as well as the tool maker HBW-Gubesch Kunststoff Engineering GmbH, Wilhelmsdorf, can be seen at Maincor's Knetzgau works. Maincor uses this production site, located just a few kilometres from its head office in Schweinfurt, to concentrate its business covering technical tubing systems, which are, for example, supplied to the automobile sector or the white goods segment. "We earn just under twelve per cent of the annual turnover of the Maincor Group from our industrial products sector", reports Tobias Kuhn, who is the head of sales and distribution in this division. Around 100 staff are employed at the Knetzgau works, the machine park of which encompasses 19 extrusion facilities, two injection moulding machines from

Sumitomo (SHI) Demag, some assembly plants and also a fluoridation plant.

Unique plants for specialized products

The company's core competence is in the mono- and multi-coat extrusion of corrugated and smooth tubes. So as to be able to cover a nominal width spectrum of 4.5 to up to 50 mm in the case of corrugated tubes, the Knetzgau works operates 14 machines known as corrugators. These corrugated tube shaping machines are made in-house by Maincor's machine manufacturing division. "It is true that we buy in the extruders, but we do construct all further plant components ourselves from the calibration onwards", emphasises Alexander Rudolph, Director of Production. "As far as I am

aware, there is no other corrugated tube manufacturer in the world manufacturing corrugators and the tools in-house at the same time. This means our customers benefit from systems which are perfectly coordinated with each other", Tobias Kuhn adds. The broad range of produced tube diameters and the variety of products are reflected in the machine park, as is highlighted by Director of Production Rudolph: "You will find virtually only unique set-ups here. The high-tech, individually coordinated processes in Knetzgau call for highly qualified personnel to be employed in production."

High unit figures exclude intermediate storage

A genuinely unique set-up is also represented by the fully automated plant for manufacturing dishwasher escape hoses which went into production at the end of 2008. Behind the product, which may initially appear quite unremarkable, there is concealed a rarity in operating technology. To produce the combination of PP corrugated tube with the injected flexible pipe collar made of TPE, the extrusion process at Maincor was linked in-line for the first time with the injection moulding process. With the market launch of

a new series of dishwasher machines at the beginning of 2009, Maincor had to develop a new production design. "The unit numbers were simply too large. Interim storage of the hoses extruded in the first step would not be efficient and would hardly have been manageable", emphasises Alexander Rudolph.

Hand in hand: Sumitomo (SHI) Demag, M.A.i. and HBW-Gubesch

Unit numbers of several millions can only be realised in a cost-effective manner using a fully automated process. "When we began this project at the beginning of 2008, we negotiated with several suppliers. But only Sumitomo (SHI) Demag, together with their partners of M.A.i. and HBW-Gubesch, addressed our specific wishes in a customised manner", remembers the Director of Production. "New ideas and concepts were generated even in the very first discussion with the three companies. That is what convinced us. When all is said and done, all three of us were entering unknown territory with this project." After a successful conceptual design phase, followed by design FMEA and the construction of prototype tools, sampling was undertaken by the tool maker, HBW-Gubesch.

Whenever Alexander Rudolph thinks back to the project development stage, his enthusiasm really begins to shine through: "We planned 40 weeks for the project and were finished after 39 weeks. No-one can do better than that. All the partners worked hand in hand with each other." Sumitomo (SHI) Demag brought all the threads together. "Project Director Klaus Schmidtke from Sumitomo (SHI) Demag drove the project forward perfectly", says Director of Production Rudolph with satisfaction.

Fully automatic from the granulate to the finished escape hose

Synchronising the continuous extrusion process in time with the injection moulding process presented the greatest challenge. In order to coordinate the injection moulding cycle times and the take-off speed for the tube extrusion with each other to an optimum degree, the injection mould was fitted with eight cavities for the injection of sole of the pipe collar weighing around 20 g. This produced the size of the delivery belt for the automation. This is how the course of work appears in detail: the over one hundred mould blocks arranged in a row of the corrugator connected to the ext-

The special feature of this escape hose for dishwashers is particularly to be found in the manufacturing process: for the injecting of sole of the flexible pipe collar made of TPE (right), the injection moulding was linked in-line with the extrusion of the corrugated tube made of PP.



runder shape form the continuous hose as a corrugated tube with smooth areas. The continuous hose initially passes through an ink jet imprinting which ensures gap-less traceability. After this, a cutting station captures the continuous hose, stretches this into the precise position and cuts the individual tubes to a defined length. The individual hoses are then transported via a narrow conveyor belt into the automation area upstream of the injection moulding machine. There they are fed onto a delivery belt consisting of parallel individual rails, which operates as an intermediate buffer. As soon as eight individual hoses are lying next to one another, a Motoman buckling arm robot picks these up and swings in its holding point to the Sumitomo (SHI) Demag injection moulding machine: a 1,500 kN machine on the Concept 150/520-840 type with NC4 controls.

In order to ensure that the limp hoses can be fed into the hot runner mould in precisely the correct position, the robot grasps every hose at four points spread throughout its length. When the injection moulding mould opens, the robotic arm enters with the eight tubes arranged in parallel above each other, positions the ends of the hoses to be insert moulded and, in the same move, removes the hoses from the mould which have been insert moulded with TPE. During the injection moulding process, the robot lays the hoses which have already been insert



The corrugated tubes which have been cut off are transported into the automation area via a conveyor belt (left below) and are fed into the injection mould in batches of eight units each via an articulated robot.

moulded onto a further delivery belt and then finally swings back into the receiving position at delivery belt one so as to pick up eight tubes once again. At the same time, the insert moulded hoses are moved from delivery belt two to the O ring assembly station under camera supervision and from there further onwards to be tested for water-tightness, during which possible bad parts are rejected. The good parts are collected in a box up to a defined number of units, then bandoliered and then fed to an operative who packs the escape hoses into lattice boxes – the only manual activity involved with this product.

Individual automation task “simply” solved

The entire machinery has run since the beginning throughout the entire year in a three-shift operation and produces the high numbers of units in a reliable and fully automated manner while adhering to the strictest quality criteria. In drawing up and executing the automation design, M.A.i. consistently paid attention to a simple construction mode. Thanks to the use of a buckling arm robot, despite the great length of the hose, the automation plant accommodates all working steps on a compact surface area.



Through the injecting of sole of the flexible pipe collar made of TPE onto the PP tube, both a positive and also a firmly bonded connection is created, which ensures total water-tightness when the dishwasher hose is attached to the siphon.

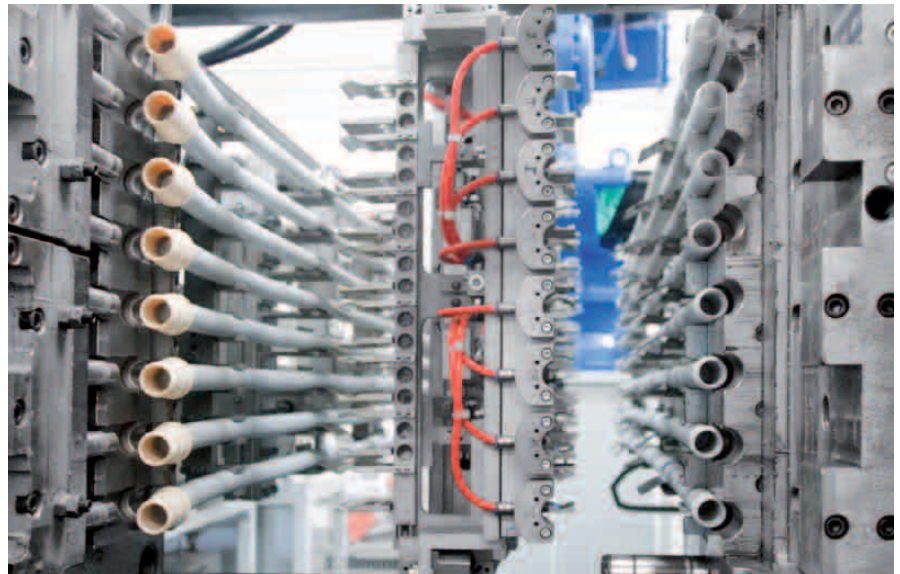
Customized Automation

Sumitomo (SHI) Demag works closely with its customers and specialist partners in the area of automation, tool technology and peripheral equipment in order to produce customized solutions for one-off automation challenges. Sumitomo (SHI) Demag is always on hand to provide its customers with expert assistance, from the original idea through to the design, project planning, installation and commissioning of the solution and the final comprehensive service package. The Customer Engineering division plays a major role in this by liaising closely with customers and specialist partners to guarantee the smooth coordination of the project and by ensuring that innovative and individual solutions are implemented and combined to create an attractive overall concept. As an experienced specialist in the field of automation, Sumitomo (SHI) Demag’s Klaus Schmidtke has taken over this function in the development of the Maincor manufacturing concept to combine injection moulding and extrusion.



Maincor Sales Director Tobias Kuhn and Director of Production Alexander Rudolph (from left) are satisfied with the complete solution.

With this well thought-through automation design, synchronising the extrusion and injection moulding process, the project partners have created an economical complete solution for Maincor to manufacture escape hoses. "At the produc-



View from the operating side of the injection moulding machine into the mould with retracted robotic grip after the tubes to be insert moulded have been fed in and before the manufactured hoses with pipe collars have been removed (left).

tion site in Germany, we have to automate manufacturing processes such as this fully so as to be able to withstand both the pressure on prices as well as even being able to achieve such unit numbers in the first place," is how Sales

Director Tobias Kuhn concludes the interview. ■

Author

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Freelance specialist journalist

The Maincor Group

The Maincor Group of companies was founded in 2004 following a management buy-out by Dieter Pfister, Gudrun Pfister and Martin Schneider and started business with 120 employees in its head office site in Schweinfurt. At the end of 2007, the company was reconstituted as a limited company. The range of business activity stretches from the processing of plastics, the processing and working of metal through to the direct distribution of an extensive sanitary and heating system. In terms of plastic processing, their core area of competence is extrusion. In this regard, the Maincor Group operates a total of 35 extrusion plants. In addition, ten injection moulding machines manufacture accessory parts as well as articles for completing modules.

Maincor AG today employs around 670 employees, who achieved an annual turnover of 109 mn EUR in 2011. The company is restructuring for the future into the four business areas of machine manufacture, building construction tube systems, civil engineering tube systems and also industrial tube systems. Maincor undertakes production exclusively at the German sites of Schweinfurt, Knetzgau, Haßfurt, Mellrichstadt, Grafenrheinfeld, Bautzen and Marl. Together with foreign distribution companies, Maincor operates in the tube sector across Europe and across the world in the machine manufacturing sector.

The company has already won several awards, for example as "TOP Innovator" in 2006, as being among "Bavaria's Best 50" in 2009 and also as "Entrepreneur of the year" in 2007 and 2009. At the end of 2011, the Chairman of the Board of Directors, Dieter Pfister, was awarded the "State Medal for Special Services to the Bavarian Economy" for his entrepreneurial foresight, the company's sophisticated innovation system, comprehensive management of information and knowledge and his great sense of social responsibility.

www.maincor.de

On site around the world

Sumitomo (SHI) Demag present at all important international fairs

Swiss Plastics, held in Lucerne from 17 to 19 January 2012, opened the round of international plastic fairs for this year. Sumitomo (SHI) Demag focused on sophisticated clinical applications. The Swiss agency of MAPAG Maschinen AG used an Int-Elect 160-680 to present to the specialist audience attending the performance capability, precision and reproducibility of the all-electric machine series. The clean-room production of applicators for a medicine dispenser housing made of polypropylene in a cycle time of 8 seconds was shown.

“There is a clear trend away from the optimisation of hydraulic and towards the purchase of electrical machines, which provide many desired features of performance from the start”, emphasises MAPAG Sales Engineer Urs Kocher. With their precise and sensitive drives, the IntElect already fulfil the special requirements of zero-defect production.

A laminar flow unit from Max Petek clean room technology company in Radolfzell ensured the provision of a clean room environment in the production system presented. A particle measurement device showed the clean room quality currently achieved to the visitors to the fair in visual terms.

In addition, the specific “IntElect Swiss Line” equipment package was also introduced, which Sumitomo (SHI) Demag offers its Swiss customers for the 50, 100 and 160 sizes. “This contains additional options which are frequently called for, such as a reinforced bi-metal cylinder, an interface for automation or an integrated hydraulic suspension”, explains Kocher.

Sumitomo (SHI) Demag was also present at the Interplastica in Moscow from 24 to 27 January with an all-electric injection moulding machine. The IntElect 100-340 with 1,000 kN clamping force produced ball point pen housings made of polystyrene. In order to remove and deposit the parts on a conveyor belt, the machine was equipped with an integrated linear robot from Sepro Robotique.

Alexander Votinov, Managing Director of the Russian agency, CJSC Sumitomo (SHI) Demag Plastics Machinery, expressed his great satisfaction with how the fair had gone and the feedback visitors had provided: “We were able to discuss many new projects and also establish initial contacts.” Interplastica 2012 showed that the Russian market is on the way to recovery. The segments

of consumer goods, medicine, automobiles, electronics and packaging in particular drove up demand for plastic products. Although the crisis in Russia has almost been overcome, however, Votinov can still see one problem: “Many Russian processors prefer Asian low-cost machines and equipment when expanding or reconstructing their production.” These make up around 80 % of the market. There is, however, a deep conviction that Russia’s accession to the WTO will lead to a rise in quality standards and thus strongly increase business with high-value processing technology.

Sumitomo (SHI) Demag also had its own première when it attended the début of the NPE in Orlando from 2 to 5 April. For the first time, the company presented the EI-Exis SP high performance series to the North American market, following its introduction at the K 2010. The hybrid drive high-speed machine put its performance capability to the test at the display stand by manufacturing a thin-walled packaging bowl with full cover labelling. The new in-mould application ran on an EI-Exis SP 200 machine equipped with a double IML hot channel mould from Marbach. The compact manufacturing cell produced



The Swiss agency of MAPAG demonstrated at the Swiss Plastics the performance capability, precision and reproducibility of the all-electric machine series with an IntElect 160-680.



Satisfied faces in Moscow: Sumitomo (SHI) Demag was able to discuss many new projects but also make new contacts at the Interplastica.



Impressive exhibit: At NPE in Orlando, an EI-Exis SP with a clamping force of 4,500 kN and a 96-cavity injection mould of Schöttli AG produced screw caps in a cycle time of only 1.95 seconds.

the 250 g bowls made of polypropylene with a shot weight of 14.2 g in a cycle time of approx. 3 seconds. In addition to the 2,000 kN size, an EI-Exis SP with a clamping force of 4,500 kN was also shown at the NPE.

Sumitomo (SHI) Demag was represented at the Chinaplas from 18 to 21 April in Shanghai jointly with its Japanese parent company, Sumitomo Heavy Indus-

tries (SHI) and Demag Ningbo. In addition to three exhibits from SHI, two machines of the Systec C series from Sumitomo (SHI) Demag could also be inspected. The version of the hydraulic series especially adapted to meet the needs of the Chinese and Asian market is manufactured at the Ningbo site and is to be offered covering the entire clamping force range from 500 to 10,000 kN within the present year. A Systec 100-430 C

demonstrated in Shanghai the high precision of this machine, which was used to produce needle covers made of polypropylene and which was equipped to handle the finished parts with an S5 linear robot from Sepro Robotique. Speed and energy efficiency were at the heart of a presentation of a Systec 160-600 C, which manufactured a 7 g heavy container lid made of polypropylene in a cycle time of 3.2 seconds. ■

Further fair dates for 2012

Sajam Tehnike Belgrade

- › Belgrade, Serbia
- › 14.-18.05.2012

PDM

- › London, UK
- › 29.-30.05.2012

Plastpol

- › Kielce, Poland
- › 29.05.-01.06.2012

Interplast

- › Joinville, Brazil
- › 20.-24.08.2012

Expo Plasticos Guadalajara

- › Guadalajara, Mexico
- › 12.-14.09.2012

MSV Brno

- › Brunn, Czech Republic
- › 10.-14.09.2012

Expoplast

- › Bucharest, Romania
- › 3.-6.10.2012

Fakuma

- › Friedrichshafen, Germany
- › 16.-20.10.2012

Emballage

- › Paris, France
- › 19.-22.11.2012

Plast Eurasia Istanbul

- › Istanbul, Turkey
- › 29.11.-02.12.2012

14 years of production in Ningbo

Demag Plastics Machinery (Ningbo) will soon have nationwide presence in China



The Demag Plastics Machinery Co., Ltd. plant in Ningbo.

Sumitomo and Demag have long been distributed locally in China as individual brands. At the end of 1998, Demag commenced production in Ningbo in the form of a joint venture with a local producer. Having been independently run for seven years now, the plant in the Zhejiang province at the harbour of Beilun is now Sumitomo (SHI) Demag's fourth production plant alongside those in Germany and Japan. Demag Ningbo's production range has consistently grown and now includes machines with up to 10,000 kN clamping force. This has meant that, in addition to China, selected export markets have also been opened up. The range is supplemented by the high-tech series imported from Europe. What is common to all machines is their technological orientation and their control platform. Production in Ningbo and the comprehensive coverage in sales and service throughout the whole of China are based on a strong team, made up equally of national and international members, under the experienced management of Stephan Greif. It is no coincidence that Sumitomo (SHI) Demag has become the leading European injection moulding

As one the largest customers world-wide, Johnson Electric purchased more than 600 injection moulding machines from Sumitomo (SHI) Demag. More than 100 machines from Ningbo were added to these in 2010 and 2011, including the new 6,500 kN Demag for a site in Brazil.

machine manufacturer in the Chinese market.

A popular saying in China is that, "A long road begins with a first step." Stephan Greif already took this step, which was very large in both geographical and cultural terms, in November 1998. "I am more than happy to have been able to experience the development of China over such a long time and to have been allowed to take part in developing our company in Ningbo and Shanghai." The resumé of the CEO of Demag Ningbo and Vice President, Demag China, also reflects to some degree the way injection moulding machine construction has moved to a basis of globalisation via internationalisation: Stephan Greif has travelled extensively throughout the world on behalf of the Demag brand, with its strong reliance upon exports, from the country of origin, Germany, worked on site in large and emerging markets and came into contact with many different cultures and people. "After many years of working in Brazil and Italy, I have now been attempting to approach the Chinese soul for 14 years. Despite having spent such a long time in Shanghai and Ningbo, I am constantly discovering new things about people in China, admiring aspects of their way of life and their magnificent culture."

A team has come together under Stephan Greif's leadership, which originates from various regions of China, other Asian countries and Germany and which encompasses a variety of skills. Tony Chan, Sales Director Asean/Oceania, has, for example, been working for Demag in South East Asian markets and Oceania since 1997. Initially based in Kuala Lumpur at the branch of Demag Plastics Asia, he operates these days as Regional Sales Director out of Shanghai. "My primary sales markets are countries in the region such as Malaysia, Indonesia, Thailand and Vietnam, but also Australia and New Zealand. We shall also be expanding our sales activities in the course of the next few years to Taiwan, Vietnam, Indonesia and the Philippines." The target set is to increase the share of exports made up by production from China from the 10 per cent in 2010 to 30 per cent in the medium term.

System C: The series of injection moulding machines made in China

"Our target customers are manufacturers in the electronics and electrical engineering industry and producers of plastic packaging, together with automobile manufacturers and their suppliers", states Chan, "and our machines are optimised for such clients: all-electric precision machines, hybrid high-speed machines,



multi-component machines and hydraulic standard machines with cost-saving drive technology."

Markus Stadler came to Ningbo to take up the post of Director of Technology six years ago. In this process, he helped organise the move into the company's own new factory with a production floor space of more than 10,000 square metres. Agenda item number one currently for him is the expansion of the Systec C hydraulic series. The machine, designed in association with the other production sites in Germany and Japan and manufactured in China, will be available in the course of 2012 across the full range of clamping forces, ranging between 500 and 10,000 kN. Based on the international Systec platform, it has been fully adapted to meet the needs of the Chinese and Asian markets. The Systec C is the outcome of the collaboration between the German, Chinese and Japanese engineers at all of Sumitomo (SHI) Demag's sites. As a fully regulated, hydraulic all-purpose machine, it also serves to manufacture a variety of plastic parts for the most varied purchasing sectors.

Demag Ningbo produces up to 60 machines per month. "In the past few years, we have consistently improved our supply chain, product quality and efficiency and have cut lead times. Production in Ningbo rests on a team of 180 employees, of whom more than half have already been loyal members of staff of Demag Ningbo for more than ten years," states Markus Stadler. "In terms of Chinese relationships, that is a very long period to work for one company", comments Sascha Stellmacher, Director of Quality. They have succeeded in meeting the needs of our customers to an optimal degree, not least due to a production process with a manufacturing philosophy and quality management system from Germany, competitive prices, reliable distribution and skilful after sales service.

Great success with Chinese processors

Richard Chen has been with the Demag Ningbo team almost from the beginning

and was able to see with his own eyes how production grew from zero to 600 injection moulding machines per year and helped to bring about this success in sales. As Sales Director and Deputy General Manager at Demag Ningbo, he is now responsible for the sales and distribution of the machines manufactured in China. "The high precision and durability of the machines help our Chinese customers to supply high-value quality plastic parts at competitive prices." As well as the predominantly Chinese companies, we also continue to count ever more

3,000 machines produced locally. Most machinery stems from the last two decades, although some machines have already been in service for more than 30 years.

After the Chinese economy has long been concentrated in the East and south coast of the country, the government is now striving to strengthen industrial production in the centre, North and West of China in future years. Against this background, Demag Ningbo will also expand its distribution and service centres in the



In the case of Moxel Contact in Chengdu City, Demag Ningbo installed 79 machines just in 2010.

internationally operating American and European corporations among Demag Ningbo's customer base. "As the Chinese economy develops, more and more Chinese plastic processors are turning towards high-performance machines produced locally so as to produce better quality with high value creation", Chen asserts.

Service and support for 6,000 installed machines

The base currently installed in the Chinese mainland amounts to around 3,000 injection moulding machines supplied from Germany with clamping forces ranging from 250 to 40,000 kN. To this have to be added at least a further

emerging provinces step by step so as to ensure its presence throughout the whole of China. Demag Ningbo already provides optimum coverage in the Middle Kingdom even now, not just in terms of distribution but also service. Customer service in China is structured in this process according to the origin of the machines. The After Sales Department, with its head office in Ningbo, thus supervises 14 engineers based in Dongguan, Chengdu, Suzhou and Shanghai. The team around Manager Allen Zhou is responsible for the starting up of new Chinese machines at the customer's site, for machine acceptances, test runs, mould validations, process optimisation and, not least, customer training. Four back office members of staff are also employed in



Stephan Greif, CEO of Demag Ningbo and Vice President of Demag China has lived in China since 1998.

Ningbo and Dongguan, who take care of the provision of spare parts and customised special solutions. The After Sales Department for imported machines from Germany which have been installed in China is headed by Strong Mao. He is responsible for maintenance, training and sales of spare parts. Apart from having responsibility for the injection moulding machines imported from Germany, the

Tony Chan, Sales Director Asean/Oceania, operates as Regional Sales Director from his base in Shanghai.



After Sales Department also looks after the machines stemming from European and American off-shoring and represents Sepro Robotique in China. Strong Mao is responsible for sales and maintenance for the French manufacturer of linear robots.

Additional regional offices also ensure a local presence: the office in Guangdong (South China) is headed by manager Mike Qin. He is responsible for the sales and service of all locally produced machines from Ningbo and all machinery imported from Europe. He also coordinates the sales team in the Guangdong region. The Suzhou office in Jiangsu province serves as the agent for Demag Ningbo machines and is headed by Sales Director Christian Zhang.

Positive interim balance for Demag Ningbo

In the rapidly changing Chinese market, Stephan Greif likewise envisages rapid changes occurring on the part of customers – especially in terms of internationally leading automobile manufacturers and electrics corporations: “As one of the global players in injection moulding machine production, we aim at fulfilling our

Richard Chen, Deputy General Manager, Demag Ningbo, is responsible for the sales and distribution of the machines manufactured in China.



customers’ demands again and again in terms of performance, technology, quality and service on a daily basis.” After 14 years in China, Stephan Greif has taken new steps again and again on the long road in China. His intermediate balance shows, however, a clearly positive result: “Our staff build high-performance and high-value injection moulding machines with good quality. Our parent companies of Demag and Sumitomo support us with the latest technology. China and South East Asia are rapidly growing markets. We have a large number of loyal customers. In addition, we offer perfect service quality. Could I have a more interesting job?”

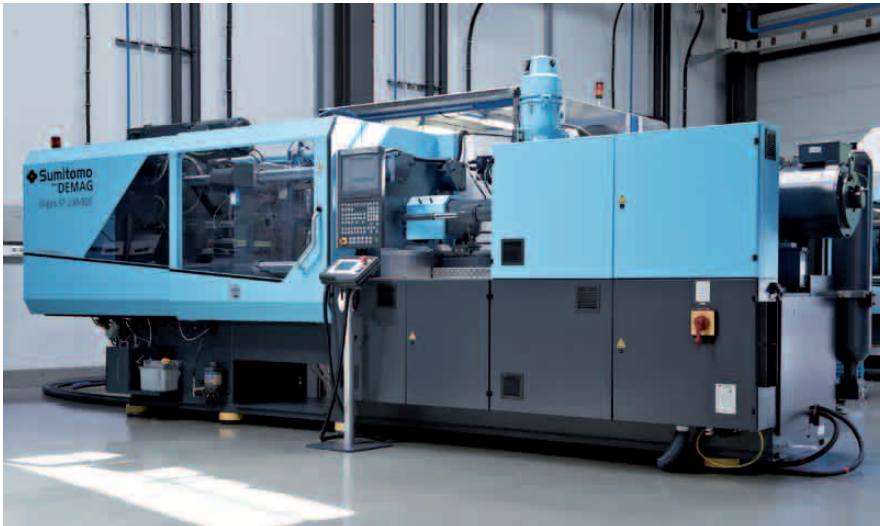
Markus Stadler also looks back with satisfaction and forwards with confidence: “I have wonderful colleagues here in China, who give me their support. I especially appreciate the friendly and understanding way cooperation is carried out between all departments. I am very happy to be a member of our team in China and to see how the company continues to grow from year to year. Demag Ningbo has become a new family for me and one in which I feel at home. I am looking forward to working with my colleagues in China for many years yet.” ■

Markus Stadler, Director of Technology, moved to Ningbo from Germany six years ago.



More power for the EI-Exis SP

Collaboration with valve specialists Moog accelerates injection and ejection during high-speed injection moulding



Hybrid-driven EI-Exis SP high-speed injection moulding machine from Sumitomo (SHI) Demag – shown here with 2,000 kN clamping force.

With the launch in 1998 of the EI-Exis, Demag introduced a very successful design with decentralised electric drives for rotary movements and high-performance storage hydraulics for linear movements. Sumitomo (SHI) Demag has both the tools and the expertise to simulate all axes of an injection moulding machine covering all components to a very fine degree. In the further development of the current EI-Exis SP machine series, they subjected the injection hydraulics and ejector unit to a precise simulation exercise and defined the user requirement specifications for the valves. Working closely with valve manufacturer, Moog, the valve properties were optimised and the user requirement specifications were “translated” into piston geometry. This consistent and systematic customisation of the axis and regulator valves led to an even greater enhancement of the already high injecting and ejecting performance of the EI-Exis.

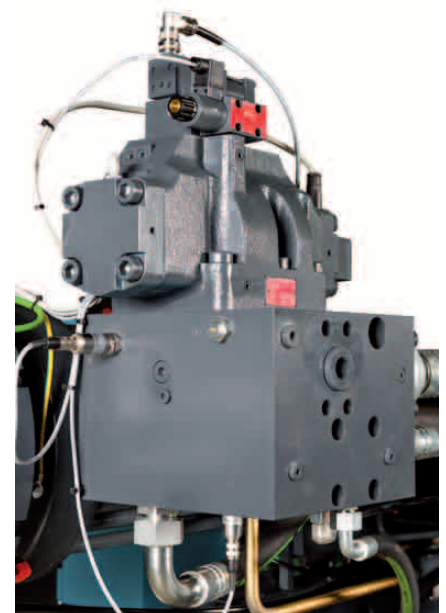
The EI-Exis SP from Sumitomo (SHI) Demag has already established itself as a high-speed machine and has gained a considerable market share in the production of locks and thin-walled plastic pa-

ckagings in all regions of the world. The EI-Exis SP is currently available in the clamping force range of 1,500 to 7,500 kN. All sizes in the series have the same D68x series servo-proportion valve of Moog GmbH, Böblingen, fitted on both the above-mentioned axes. It is the best and quickest valve from the Moog range for use on plastic injection moulding machines. It is used on every axis on the EI-Exis SP in various dimensions. In order to implement the demanding requirements of high-speed injection moulding in machine technology, the Sumitomo (SHI) Demag technicians at the Schwaig site have worked closely with Moog in optimising this valve through customised piston geometry. A degree of dynamism and precision has been reached with the EI-Exis SP, that could not be achieved through installing the standard valve alone.

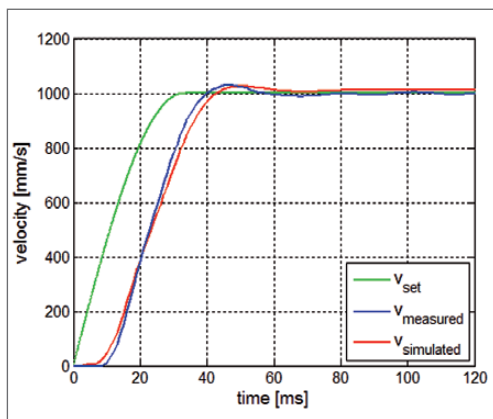
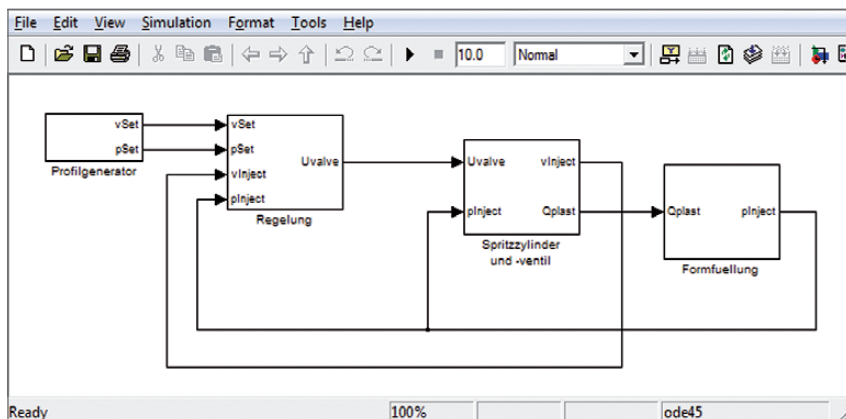
In achieving optimum performance, the injection valve was adapted to the injection axis and the ejector valve to the ejector axis. To this end, the experts showed the drive axes through a complete simulation of the respective control paths with axis, valve, oil column,

weights and cinematics on a computer. On the injection axis, for example, the control paths include the masses of all individual components, the plastic in the screw channels and in the space in front of the screw, the oil rigidity, the losses of pressure, the valve curves and the control structure. Hydraulics are required not only during acceleration but also in brake movement because active braking of the injection axis allows for the quickest possible switching time and highest positioning accuracy.

For the physical modelling, the Simulation X programme package from ITI, with its extensive library of components, was used. The optimisation of the components, in particular the optimisation of the injection valve curve as well as the rough copy of the regulator was undertaken using Matlab/Simulink, a standard tool which is widely used in university research and industrial development for designing, analysing and making rough



Servo-proportional valve in the Moog D68x series on the injection side of the EI-Exis SP with individually adjusted piston geometry.



The simulation model of the injection unit in Matlab/Simulink with the central blocks target value specification, regulation, injection unit and injection mould (left). The injection procedure commences with the high dynamics required: a comparison of the measurement on the machine with the simulation results confirms the fineness of the simulation model (right).

copies of complex systems and controls. The elasticities and dampings, among other features, were obtained from the simulation of the control paths on the computer. Once the path has been defined, the valve is integrated and the control is simulated. Following the simulation, Moog showed the simulation results in valve technology and individually matched the control piston geometry to the El-Exis SP. The control piston geometry influences the current resistan-

ces of the hydraulic axis both during injecting and also during deceleration. The respective control piston was modified for the corresponding axis in such a way that it fulfilled all demands of the user requirement specification. Subsequent tests in the Schwaig test area have shown that the simulation on the computer and the test on the actual machine agree to a very precise degree: the regulators work in a highly dynamic and precise manner in all areas of pres-

sure. By combining hydraulics and the opportunities of the latest generation NC5 plus controls, the optimum regulation design was derived for both axes respectively: in this way, the software regulator came about which can represent all the curves specified for the valve.

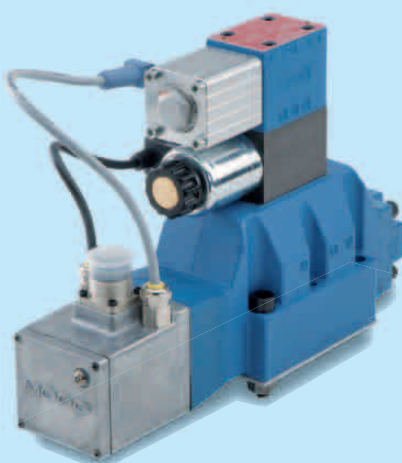
Greater precision during injecting, switching and re-pressing

The more dynamically and precisely an injection moulding machine works, the more exact the part can be formed. High dynamics expand the possibilities of guiding pressure throughout the cycle: the pressure stages are covered more quickly and more precisely – both during injecting and also during active braking, that is to say during switching to hold pressure. The expanded possibilities provided by the new valve reduce the fluctuations from cycle to cycle and increase the repetitive precision of the process.

Injection, which is regulated, depending on the path, with the assistance of the position of the screw, is followed from the switching point onwards by the pressure-dependent guidance of the hold pressure, which is decisive for determining many quality criteria. The high precision and high level of dynamism of the new valve enable lightning fast switching and a reduction in pressure to 10 % of the injection level within 35 milliseconds, instead of the 120 which has

D68x Series Servo Valves

The Moog D68x Series Servo Valves are known mainly by their high valve dynamics, due to its fast, direct-operated pilot valve with spool in bushing design. An advantage of the pilot valve is low oil leakage when the valve spool is in the center position. Energy savings on the machine are gained or realized during those phases of the cycle in which the valve does not operate. This advantage especially pays off on machines that are constantly in use, and has a positive impact in the energy balance. The high quality standards of Moog ensures that both valve dynamics and spool geometry maintain within narrowly-specified limits. Thus, Moog contributes to meet Sumitomo (SHI) Demag's high demands permanently.



been usual until now. The absolute reduction in pressure amounts in this process to around 800 bar.

High precision in a large ejector window

As many options as possible are required during the production of high-speed parts, such as the manner in which the part is ejected to allow the machine operator to present the optimum removal situation for falling or extraction parts respectively. The simulation of the ejection situation and the adjustment of the ejection valve on the El-Exis SP combined enhanced positioning accuracy of the ejector with increased ejection acceleration. This enables the operator to define and very precisely set the ejection process on an individual basis through flexible speed control with rapid acceleration and braking procedures in a large ejection window.

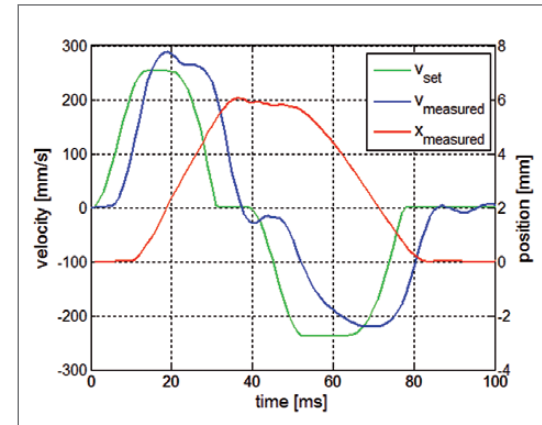
The ejector operates in a highly dynamic manner due to the simulation and Moog technology and in the production of screw caps ensures a defined removal movement and exact falling of the parts in the mould opening area. If they are to fall vertically into the chamber like a curtain, they require a high ejection speed, as the ejector must use a very short stroke to attain the same speed as the machine uses to rip open the mould. It thus removes, for example, screw caps in something like a fixed position relative to the machine.

Active acceleration of speeds with activeAdjust

Every axis of the El-Exis was previously equipped with a fixed universal set of regulation parameters, which only allowed the machine operator to adjust pathways and speeds. Any modifications beyond this could only be carried out at the customer's site with the help of a software technician.

Thanks to the new activeAdjust function, the customer can now adjust their machine to their own individual needs and demands themselves: activeAdjust offers the user the opportunity of accelerating every single machine movement depending on the process and part thereby optimising the cycle time. This therefore also applies to the ejection movement and the switching from injection pressure to hold pressure. These movements can be accelerated or decelerated with the aid of slide regulators in the controls.

In addition, activeAdjust still allows individual regulators to influence the steepness of speed ramps. This ramp adjustment allows the production process to be adjusted with the optimum coordination of injecting, switching, ejection dynamism and clamping unit in an application and mould-specific manner to a degree of total precision. Overall, reduced dry run times for shorter cycles and more productivity result.



Ejection movement forward and backward at a target stroke of 5.5 mm.

Higher production efficiency for packaging materials made of plastic

Mechanics, hydraulics, electronics and control engineering have to operate in an optimally coordinated manner on a high-performance machine. The costly simulation and optimisation of the hydraulic axes on the high-end El-Exis SP machine has paid off: overall, with its greater injection and braking dynamism, its shortened cycle times as well as its accelerated and precisioned ejection movement, it increases production efficiency for manufacturers of plastic packaging materials. ■

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Moog Industrial Group, a division of Moog Inc., designs and manufactures electrical, hydraulic and hybrid motion control solutions for a variety of industrial applications including plastics, metal forming, power generation, steel production, test and simulation, wind energy, motorsport and others. Moog is a leader in valve technology and provides the fastest and most reliable servo valves for high-speed plastic machines on the market in these industries. In this capacity, Moog has been supplying servo valve technology for the injection axis of El-Exis machines for a long time and, since the El-Exis SP, Moog also provides the servo valves for the ejector axis. In years of active collaboration, Moog and Sumitomo (SHI) Demag has enhanced the performance of high-speed machines several times. According to the technicians in Schwaig, Moog has technically outstanding employees with strong mechanical and procedural expertise in injection molding.

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