

INJECT

Sumitomo (SHI) Demag Magazine 02/2011

IML at the El-Exis: How paper labels decorate yoghurt pots

Liquid wood: Great potential through biodegradable injection moulded parts

Medical technology: Help for newcomers to this growth industry

At the press of a button: How liquid colourants facilitate a change of colour

Dear readers,

In the editorial at the change of the year 2010/2011 I was happy to write that Sumitomo (SHI) Demag had withstood the economic test and overcome the consequences of the financial crisis. No one could have guessed that Japan, my native land and also the home of Sumitomo was on the verge of a new ordeal of unimagined proportions. I thank all of you who have shown sympathy in so many different ways for the fate of the Japanese people.

The current order intake for our injection moulding machines is higher than it has been for many years. Large orders are coming in from key accounts and small customers, from nearby and distant markets and for all segments of our product range. Our market shares have risen significantly and our factories in Schwaig, Wiehe and Chiba are working at full capacity.



We are happy and proud that our developments are convincing more and more producers of injection moulded parts. In this issue of INJECT, for example, you can read about Herrmann AG which produces caps and stoppers with the IntElect and about Beckton, Dickinson and Company that relies on the El-Exis for its production of petri dishes. Our innovations – the all-electric IntElect 450, the new high-speed El-Exis SP, the large Systec 1300, our liquid colourant concept, activeColourChange – and many features right across the product range of machinery – are proving very popular.

I wish you a sunny and pleasant summer and cordially invite you to visit Sumitomo (SHI) Demag at one of the many trade fairs in the autumn of 2011. We look forward to your visit!

Yours

A handwritten signature in blue ink, which appears to read 'T. Okamura'.

Dr. Tetsuya Okamura
CEO

Imprint

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The E-Rangers Collectobot from Playmobil's "Future Planet" game system

80 Systecs for Playmobil

geobra Brandstätter GmbH & Co. KG, which is based in Zirndorf, Germany, is once again stepping up the production of its Playmobil system toy. Last autumn the toy producer already ordered 30 small hydraulic machines of the type Systec 25-120 with a clamping force of 250 kN for its main factory in Diethenhofen. In the winter of 2010/2011 there followed a further order for 20 Systec 25 machines for the company's toy figure factory in Malta. A further 30 Systec 50 currently on order, which have a clamping force of 500 kN, are to be delivered again to Diethenhofen this summer.

Robert Benker, Technical Manager for Playmobil, opted for the Systec 25-120 and thus for the first time chose a hydraulic injection moulding machine from Sumitomo (SHI) Demag. What he liked about this machine concept were a number of technical advantages such as the extremely stable linear guides on the clamping unit involving minimum wear on the mould. Benker was also impressed by the efficiency of the oil change intervals of 40,000 hours due to the integrated, intelligent oil management system – known for short as activeCool&Clean.

The Playmobil system toy is manufactured by geobra Brandstätter. The core of the much acclaimed and award-winning system are the Playmobil figures which have a height of 7.5 cm. In 2010 the Brandstätter Group achieved a consolidated turnover of € 559 million and had 3,250 employees worldwide. ■

St Petersburg University opts for Sumitomo (SHI) Demag

The broad product spectrum, extreme user friendliness and a well-equipped customer service are only some of the reasons why the St Petersburg State Institute of Technology, one of Russia's most prestigious universities, once again decided to purchase a hydraulic injection moulding machine from Sumitomo (SHI) Demag this year.

Today a Systec 50 is installed in the Department of Machinery and Robotics for the Processing of Plastics. Until the end of last year an Ergotech 100/420-430 Concept was installed at the institute. According to Professor Britov, Head of the Institute, there is more than one good reason why an injection moulding machine from Sumitomo (SHI) Demag was chosen again this time: In addition to the high technical standards of quality, further reasons for him are the machine's modularity and range of options. "The Systec has a control interface that really can be operated without any problems. The use of the control unit is easy to learn because our students can observe and understand the injection moulding processes in their entirety." According to Professor Britov, this is accompanied by "some really practical advantages of the Demag machines that have con-

vinced us over the course of the past years". "The wear and tear of the mould parts was already very low with the Ergotech. And if they did have to be exchanged now and then, we could always rely on the customer service."

Alexander Votinov, Managing Director of CJSC Sumitomo (SHI) Demag Plastics Machinery, is naturally pleased about this assessment. "For us this cooperation is above all a matter of sheer pleasure. But it also offers us the opportunity to introduce Russia's next generation of scientists and engineers to our products at an early stage." ■



Professor Vladislav P. Britov (left) with his academic assistant Oleg Nikolaev in front of the new Systec machine

Systec now with 13,000 kN

Sumitomo (SHI) Demag is now offering its hydraulic injection moulding machine, Systec, with clamping forces of between 250 and 13,000 kN. New on the market is the Systec 1300 with a clamping force of 13,000 kN. It is available in three versions: Basis, Smart and Performance. From version to version the Systec offers increasing efficiency, greater dynamism and additional parallel functions. The Systec will be enhanced further in the course of 2011 and will be available in sizes of up to 20,000 kN. ■

Precise machines with a dual benefit

IntElect combines low specific power consumption with high precision

All-electric machines have now become first choice in manufacturing components where a very high degree of precision is essential. Characteristic parameters, such as the cushion of material and cycle time, are kept in particularly narrow tolerance ranges so that in the case of moulds with small processing windows, for example, there is much less need for supervision. Electric injection moulding machines like the all-electric IntElect from Sumitomo (SHI) Demag also offer benefits when narrow tolerances are required for the dimensions and weight of a component. Further excellent areas of application are production in a cleanroom or other production processes that have to remain largely free of oil and particles. In the meantime the noise level also plays an important role for many investors as usually the concentration of the staff can be significantly increased in a quiet working environment

Sumitomo (SHI) Demag has supported various customers prior to their purchase decision with test series enabling customers to try out electric and hydraulic machines with their own serial moulds, particularly examining precision and energy savings. Right across the entire spectrum it was not only the test results that impressed when comparing hydraulic machines and the all-electric IntElect. In many cases customers integrated various machines of the competition into the test series and the final result was that they were not able to achieve the performance

of the IntElect. This article will deal with one of these test series in greater detail in order to highlight the benefits and potential savings of all-electric machines – particularly the IntElect – on the basis of concrete examples

A jack for saving energy

A. Raymond GmbH & Co KG of Lörrach tested various types of injection moulding machines. A. Raymond is a specialist for fastener solutions that are supplied to numerous sectors worldwide including the motor car and construction industry as well as the solar and consumer goods industry. In order to guarantee the constant quality of the parts, they must be continually and reproducibly produced within very narrow tolerance limits. Furthermore, energy efficiency is becoming increasingly important. For many years A. Raymond has been actively engaged in promoting a form of production that is carried out and fitted according to ecological criteria.

A. Raymond selected a jack made of PA66 with a 25 % glass fibre reinforcement as a reference for the machine tests. The jack is produced each month for the automotive industry in volumes of more than 250,000 units, has a component weight of just over 1 gram and is manufactured in a 32-cavity mould. During the test on the premises of Sumitomo (SHI) Demag the parts were first

produced on a hydraulic Demag Ergotech 150 (clamping force: 1,500 kN) with a cycle time of 9.9 s, simulating batch production. Then the same experiment was carried out with the all-electric IntElect 160 (clamping force: 1,600 kN). Independently of this, A. Raymond examined an electric 1,600 kN injection moulding machine of a second manufacturer using an identical mould.

During the experiments the energy consumption during one hour of production was measured. Under batch production conditions this resulted in an energy consumption of 15.5 kWh on the hydraulic machine. This corresponds to a specific power consumption of 0.84 kWh per kg of processed plastic.

During the same cycle time the IntElect needed 7.38 kWh. This means a reduction in energy consumption by more than half (picture). This means that the specific power consumption for this machine is only 0.40 kWh/kg.

The use of the all-electric drive technique has made it possible to optimise the process settings and the machine movements even further. This means that the IntElect reached a cycle time improvement of 35 %, to 6.45 s. Productivity is significantly improved through the significant increase in output. After the shortening of the cycle time the IntElect had an energy consumption of 9.62 kWh or 0.34 kWh/kg.

The effects that energy savings and an improvement in cycle time have on productivity can be seen in the following situation: By changing to the IntElect 2.5 more parts can be produced with the amount of energy originally needed in the customer's production process (15.5 kWh)

The electric machine of the second machine manufacturer also shows advantages in comparison with the hydraulic Demag Ergotech 150 with a clamping force of 1,500 kN. But these were outshone by both the original and the optimised cycle times of the IntElect with regard to energy consumption. At a cycle time of 9.9 s this machine required about 32 % more energy. At a cycle time of 6.45 s the additional consumption amounted to some 15 %.

An additional investment that pays off

In principle electric machines are more expensive than hydraulic

machines as it costs more to produce the drives. A detailed cost-benefit analysis that can be carried out in conjunction with Sumitomo (SHI) Demag highlights where the all-electric IntElect shows its strength in the production of precision components and how the ongoing savings help recoup the additional investment. As was shown in the tests described, a decisive factor is the possible reduction in cycle time in the case of the electric machines and the increased productivity that results. A typical reduction of around 3 % in the reject rate also makes itself felt in a cost-benefit analysis. Further advantages of such a calculation are better availability, lower maintenance and less energy consumption. At the same time the amount of cooling required is roughly one third less than that of hydraulic machines. The costs of purchasing the IntElect are recouped in two to three years, depending on the component and the machine.

Comparative experiments like the one described above help the manufacturers of precision components to reliably assess the possibilities of all-electric machines like the IntElect. The trial data clearly show the technical and economic benefits for individual production and clearly facilitate a decision. ■

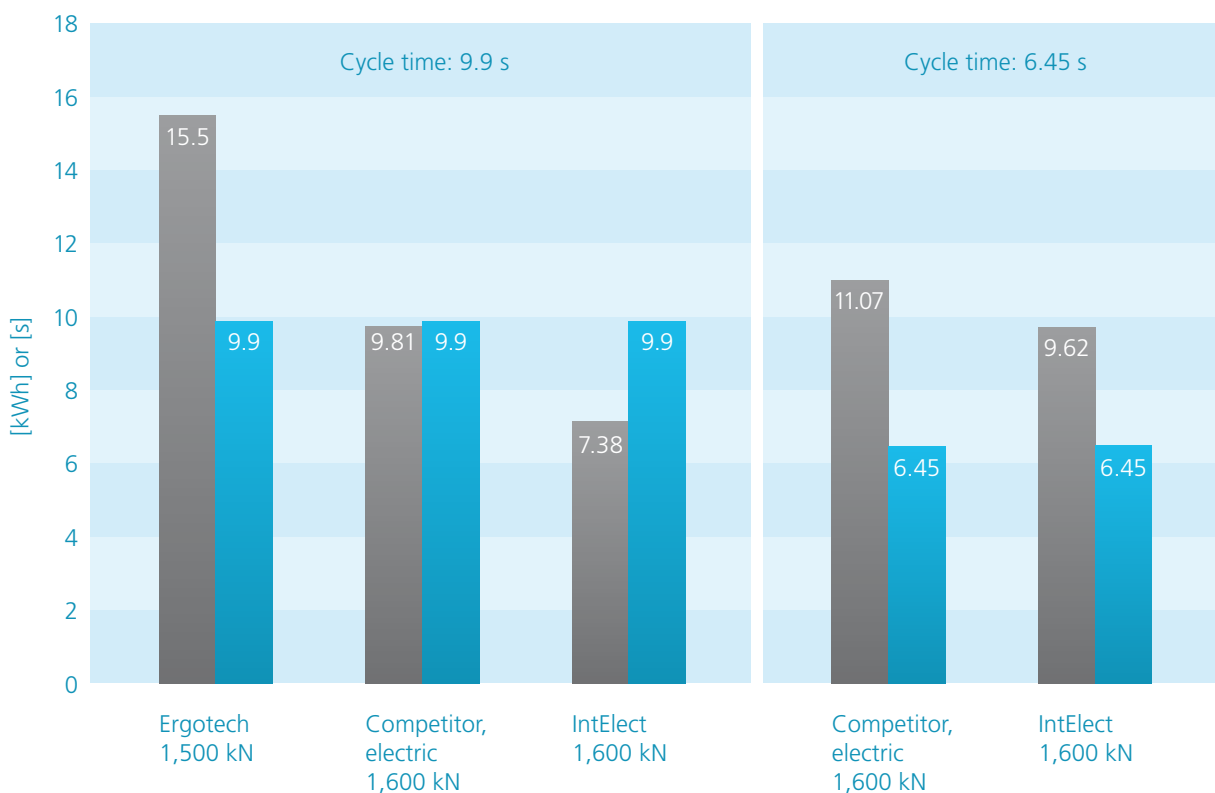
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Comparison of the energy consumption of the hydraulic Demag Ergotech 150 and an electric IntElect 160 along with a further electric machine. In the case of the electric machines the optimisation of processes leads to less energy consumption while increasing the output.

■ Measurement over one hour [kWh]
■ Cycle time [s]





View of one of the production halls at the Zott yoghurt tub factory: This is where the IML tubs are made for various products.

New IML manufacturing concept for an export winner

The Zott dairy produces its own decorated yoghurt tubs

The contents of the polypropylene tubs from Mertingen are well known far and wide: Zott GmbH & Co KG is famous for its dairy products that can be found on supermarket shelves under brand names such as Zott Sahne-Joghurt, Monte, Jogobella, and Zottarella. For the entire product range around 800 million kilograms of milk are processed each year and delivered to 75 countries from the three production sites in Mertingen, and Günzburg in Germany and Opole in Poland.

The independent family enterprise, founded in 1926, has committed itself to innovation and research, a mission it has realised with its own tub plant on the works premises. The tub plant was built in 1987 and now produces some of the containers that Zott needs for its products. 25 injection mould-

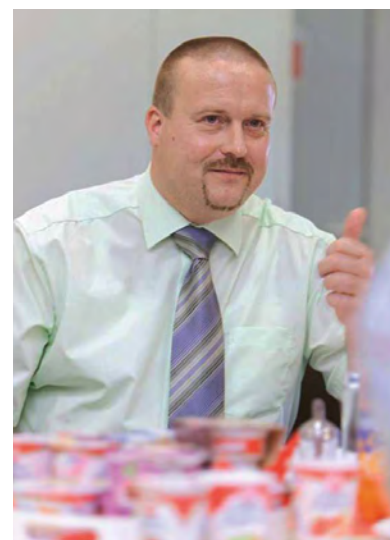
ing machines are currently in operation here.

IML technology with a paper label

“We produce some 600 million tubs each year,” says André Liebscher, Production Manager of the tub plant. “We also buy containers in addition, as our own production concentrates on a narrow range of component weights and shapes.” For the paper in-mould labels it needs Zott works with a regional supplier in as far as there is no direct imprinting on the tubs.

For five years Zott has been producing its own plastic “goblets” for its premier brand, Zott Sahne-Joghurt, using the in-mould process. The injection moulding machines from Sumitomo (SHI) Demag, type EL-EXIS 250-1450, produce the goblets all round

the clock using the IML technique. “At the same time, machines of the same type produce the Zott Jogolé tubs,” explains Liebscher. The handling systems on both machines stack the tubs before they are transported on to the packing station.



Project Manager André Liebscher in a discussion



The new EI-Exis 350 produces yoghurt tubs for an export product with an 8+8-cavity stack mould. As André Liebscher (centre) and Michaela Matthäus (right) explain, the IML technology replaces the previous printing of the tubs.

A sensor detects the label during the quality assurance phase and picks out any tubs that have been left undecorated. Thanks to the simple geometry of the tubs, this is a very fast process, says Liebscher. The tubs are then checked for holes at a turning station by applying a voltage. The tubs with no flaws are packed at the plant's own cardboard packaging system.

High output – high delivery reliability

The tubs from general production are each designed to hold 150 g of yoghurt. "The combination of several machines for one product and the high output this entails guarantee a cost-effective production process. Producing our own tubs gives us an economical delivery situation at the filling stations."

Zott has decided in favour of several identical machines from Sumitomo (SHI) Demag, all with identical features, in order to simplify the general technical conditions for production. "Spare parts, functions, tools – everything is identical and that

optimises our process," says André Liebscher, commenting on the company's decision

16 tubs in 4.8 s

The dairy in Mertingen has launched a new product for the Zott Jogobella line supplied to the markets of Central Europe. The product has been on the market since the beginning of the 1990s and, so far, all tubs have been imprinted immediately after production.

Since recently the alternative has been produced on a new machine. For this purpose Sumitomo (SHI) Demag supplied an EI-Exis S 350-2300 with an 8+8-stack mould producing in a cycle of 4.8 seconds. „We chose the EI-Exis due to its low energy consumption, an aspect that is very important for us," explains Liebscher. "We have also integrated the IML paper technique into the new machine." ■

Removal position at the 6-cavity moulds: The handling system removes the finished tubs (left of the mould) and inserts new IML labels for the following cycle (right of the mould).





The storage system for the labels allows the simultaneous production of tubs with varying motifs.

Two patterns from the same machine

Depending on requirements, the system produces with two different label motifs simultaneously. They can also be exchanged during production – due to 32 integrated change systems. Quality control combines a sensor that checks the position and the presence of the label and a hole test is carried out using high voltage. The company is

confident about its new manufacturing concept. „We not only have a very high output, but also a new transport system to the packaging machines. Thanks to the latest technology, this runs on little electricity and the version used by Zott is the first of its kind to be used in the production areas.

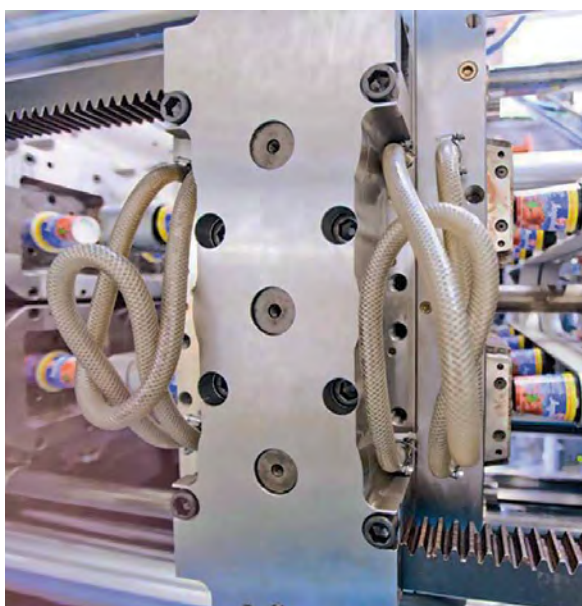
Zott intends to use the new machine to develop its internal production, and not only from a

technical point of view. „We always wish to make use of the new opportunities that make sense for our production,“ says Production Manager André Liebscher. „That’s part of our company philosophy and it makes our work easier. It also enables us to optimise the cost-effectiveness of our production and our value chain itself. ■

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View of the stack mould at the new production plant



Finished IML tubs before further transport



Specialists for caps and stoppers

Precise production and a clean environment on the premises of Herrmann AG

A further group of customers is supplied with caps and stoppers by Herrmann AG of Walzenhausen in Switzerland, for medical, pharmaceutical, cosmetics and food packaging. This company, which successfully specialises in the production of plastic caps and stoppers, relies on all-electric injection moulding machines in order to work economically, on the one hand, but also in order to achieve a clean production environment.

Each year the Appenzell company supplies more than 650 million caps and stoppers and closure systems to customers in more than 40 countries. The product range includes both standard products and numerous customised solutions, including stoppers filled with desiccant material, closures with inlays or tamper-evident and childproof closures. The customised articles, constituting more than 90 % of all deliveries, even make up the lion's share of the portfolio. Herrmann – which is still a family-owned enterprise – has 73 employees.

Fanny and Ernst Herrmann, who founded the company in 1946, started out with a small precision workshop. The inventor Herrmann discovered plastics as a production material while visiting Germany in 1950 where he spontaneously followed a sign leading to a plastics exhibition. As Herrmann already had experience in constructing tools, the step to mould construction for the processing of plastics was not far away. He carried out his first

experiments with simple mould forms and plastic granulate in his oven at home. This is how the first usable closures were made. The first customer was a regional drug manufacturer who still orders its closures from Walzenhausen.

Experienced niche supplier

As Philipp Gaus, Managing Director for Engineering and Sales, explains, Herrmann has developed into a niche player with a very good reputation. "We are specialised in the production of caps and stoppers and will stay in this field," he says, explaining the basis of the successful business concept. "In this area we offer a high degree of flexibility and also produce small lot sizes."

In many of the cases Herrmann is consulted at the very beginning of the development of a cap or stopper, says Gaus. "At the moment we're developing a closure for a milk product that is supposed to look as slim and as light as possible. The design of the bottle is already finished. Now we are adapting the closure to match the slim form. So in addition to the technical dimensioning of the part we are also carrying out design work." The material used is usually polyolefin plastic, but Herrmann also processes COC, PS, PA or TPE as a soft component. All materials used are listed on the basis of the target sectors as around 60 % of the closures are for the pharmaceuticals industry; the other products are mainly for

the medical supplies, food, cosmetics and agro-chemical sectors. So the company also has the necessary national and international certifications.

All moulds are produced in-house. "The know-how for our closure solutions remains within the company, right from the very first stage of production," says Gaus. "The integrated manufacturing of moulds makes us fast and flexible, also during production, due to the benefits that this brings in maintenance and service."

The products are manufactured in three-shifts on a total of 42 injection moulding machines with clamping forces of between 600 and 2,000 kN. As most closures are supplied to the pharmaceuticals and cosmetics industry and also the medical supplies sector, around half of the machines are equipped with a laminar flow module. Since 2009 Herrmann has also been producing with a cleanroom of class GMP-C to which up to nine machines can be connected.



Customised caps: Caps like this made of polyethylene are a typical Herrmann product that can be produced hygienically and economically with electric IntElect machines.



Multi-cavity moulds: An eight-cavity hot-channel mould during setup

“So, depending on the product, we can produce under normal conditions, with laminar flow only or completely under cleanroom conditions,” explains Gaus. “In the cleanroom itself we then integrate various follow-up processes.”

The future is all-electric

A few years ago Herrmann AG took the strategic decision to use more all-electric injection moulding machines after making an internal comparison of hydraulic and electric models. The tests were conducted with a 24-cavity mould for small screw caps, each on an injection moulding machine with a clamping force of 750 kN. “We achieved a cycle time improvement of around 6 per cent,” says Gaus, which, in arithmetical terms, means an improved output of more than 13,000 caps per day. Electricity consumption more than halved using the electric machine with this application and the consumption of cooling water also fell significantly. “All-electric machines are usually rather expensive,” says Gaus in conclusion, “but we soon re-

couped the investment through our production.”

Among the machines chosen by Herrmann AG were those manufactured by Sumitomo (SHI) Demag. “We were looking for an innovative partner who is actively represented here in Switzerland,” says Gaus. According to him this was the case with Sumitomo (SHI) Demag, who is represented in Switzerland by MAPAG Maschinen AG in Bern. “On top of this, I have a partner who has many years of experience in the market for electric machines.” Also of importance for him are the so-called soft factors which play a role in an often sensitive production environment. “Electric machines are more hygienic to operate, which is an important factor for the cleanliness of our products. In addition, our staff benefit from a quieter working environment with less need for air conditioning, so they are more concentrated and can work better.”

Two years ago we introduced the first machine from Sumitomo (SHI) Demag at Herrmann and since then have already integrated six IntElect into our production process.

Versatile use of the machine

“In the cleanroom there is also an IntElect 100-340 next to a 2K machine. At the moment we’re producing a component made of polyethylene for the pharmaceutical industry,” explains Gaus. “With this machine we can also produce in the cleanroom, depending on requirements or, as in this case, we can make elements for the injection technique under a laminar flow hood with a component weight of less than

0.082 g.” Gaus points to the display of the machine’s control unit: “In the cycle time we produce in a very reproducible way with the IntElect: At a cycle time of 9.2 s we have a standard deviation of 0.014 s at a material cushion of 0.01 mm.”

Alongside it a new IntElect smart with a clamping force of 500 kN is installed the very next day. This is to serve as a universal machine for small shot weights. The term “universal machine” can be used to describe most of the injection moulding machines used by Herrmann. All of them are generally designed in such a way that they can work with all moulds that fit their parameters. “Thanks to this measure, we always have an optimum utilisation of capacities,” says Gaus, who then shows three further examples of how Herrmann adjusts to the lot sizes of its customers

Of the two further IntElect 100-340 injection moulding machines in the production halls one is

The company’s own mould construction: Managing Director Philipp Gaus (right) explains the special features of a mould for syringe pistons to Stefanie Lauterbach of Sumitomo (SHI) Demag, and Urs Kocher of MAPAG Maschinen AG.





Optimised utilisation of capacities: Most machines have been designed as universal machines that can be rapidly refitted; this IntElect can produce both with and without a laminar flow hood and also in the clean room (left) if necessary.

currently making tube caps of polyethylene with a 24-cavity mould. "A typical batch project," comments Gaus. "After an output of 120,000 units, production is suspended until the next order arrives and then we readjust the equipment for a new product." This is exactly how the neighbouring machine, which is currently fitted with a screw cap mould for an output of 360,000 units, has been designed. The screw cap, which weighs 9.2 g, is produced in a 9-cavity mould in almost 20 s. The cavities are arranged in a radial constellation – one seen in many of Herrmann's moulds due to the optimum balance it provides. Today an IntElect 160-500 is being fitted up for a new production process and in the afternoon the production of an HDPE cap with an 8-cavity hot-channel mould will begin on this machine

One of the projects that runs all through the year is a tube cap for mayonnaise: It is produced by two machines 24 hours a day in all colours needed. Caps for spice jars, tubes of toothpaste and eye drops are often produced in large volumes as well.

Continual modernisation

For some time now Herrmann has been adapting its moulds to the clean production conditions that are achieved with electric machines. As Gaus explains, the company is converting all chain drives in the moulds to electric drives. "Then it's easier for us to set the moulds and we benefit from the fact that no more grease enters the production environment, as is the case with the electric injection moulding machines. On the whole setup times should also be shortened with the new drives." Gaus will keep a continual eye on the machinery. Each year two

machines are to be replaced by the more economical and more precise electric machines so that in future production can be carried out in accordance with the state of the art and commercially up-to-date.

Following the traditions of the enterprise, joy in innovation, motivated staff and modern means of production are among the success factors of Herrmann AG. ■

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Dr. Bettina Schnerr-Laube
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Cleanroom-sensitive mouldings are finished and packed in a clean environment.



Reliable injection moulding of liquid wood products

Alento AG produces cremation urns made of renewable raw materials

With a cremation urn in the thermoplastic biomaterial Arboform Alento AG has developed a product made from a renewable raw material. The search for a reliable injection moulding process for perishable "liquid wood" was undertaken in close cooperation with Sumitomo (SHI) Demag.

Herbert Perschl, Managing Associate and Founder of Alento AG, presents a collection of his urns. "I've been interested in thermoplastics made of renewable raw materials since the 1990s when I worked for a motor car manufacturer. Our experiments with the wood material Arboform in our own company have been carried out since 2002." But why urns? "It had to be a product capable of being produced through injection moulding that we could market directly and rapidly," says Perschl. "And undertakers are increasingly looking for urns made of environmentally friendly materials that decompose when they come into contact with microbes. Moreover, we had a firm customer for the product in the form of the crematorium of St Gallen."

Formulation controls the decomposition process

Herbert Perschl spreads out a mixture of Arboform granulate (produced by Tecnar GmbH of Ilsfeld) on the conference table. "Because we produce urns

made of liquid wood with many different material properties from different mixtures of raw materials, we are able to control

Alento produces urns made of liquid wood and also other bio-products from different mixtures of raw materials (photo: courtesy of Alento)



the decomposition process, for example. An examples are urns for burial at sea. We can design their material in such a way that they decompose in water within three days. We need much longer for the original urns, which look the same from the outside, between one and three years depending on the material and the type of soil."

The moulded part weight of the urns that Alento sells throughout Europe is approx. 1 kg at a capacity of 4.5 l. Smaller versions, such as for pets, are being

prepared. Compared with the usual urns made of natural materials, the Alento urn is more stable and has a more attractive surface. In addition, it offers a patented, ash-proof lock mechanism based on a special sealing contour between lid and container which does not use glue. If required, the company can supply a version where the lid is no longer detachable from the closed urn. This means that the additional ash cap usual in Germany is no longer necessary.

At present Alento produces some 5000 urns made of liquid wood each year and the tendency is increasing. Manfred Zoß, who is responsible for sales and the financial management of the company, rotates an urn in order to show the grain. "The surfaces are never identical. Each urn is unique. We have achieved even more variety since we succeeded in making white and reddish-brown urns as well." The spectrum of high-quality surfaces ranges from natural to green, black and red and even to beige. In addition, there is a choice between smooth surfaces and surfaces with patterns or engravings. It is not necessary to coat the urns in clear varnish.

Herbert Perschl puts two urn lids on the table. He taps them and tries to bend the edges. "Depending on the composition, the material may be more flexible, more robust or firmer and have a high breaking strain."

Perishability as an important criterion

The bio-material that Alento uses to manufacture the urns can be thermoplastically processed. Perschl holds a veneered part for the interior of a vehicle in his hand. "Arboform can also be used below fine wood veneers as it meets strict thermal requirements with regard to the maximum temperature variations in motor cars."

The material is mainly produced from the wood components lignin and cellulose and therefore completely from renewable raw materials. 50 million tonnes of the cell wall material lignin are produced each year as a by-product from the production of paper.

The developer and manufacturer of Arboform, Tecnar, adds further natural fibres such as flax or hemp as well as natural additives to the lignin powders, in addition to cellulose. Then it compresses the wood-brown mixture, which is usually coloured by artificial means, to form a pea-sized granulate.



Rope fastenings fasten ropes to posts, for example, and later decompose together with the wood

Arboform, tougher than wood and mouldable into almost any shape, is practically an invitation to developers to think up some ideas. Herbert Perschl takes a shoe tree out of the cupboard. "This product ensures that a shoe keeps its shape. At the same time it discharges moisture." As the material is obtained from regenerative sources, it is completely free of pollutants, biologically degradable, compostable and recyclable. And unlike other bio-materials, it does not need starch derivatives. Alento refuses to use these in plastic products for ethical reasons, especially as the starch obtained from plants is a foodstuff. Apart from this, speculators are driving up the price of starch because it is also needed for the production of biofuel. Arboform even leaves less waste than solid wood

For Alento this perishability is a decisive criterion. Manfred Zoß passes around rope fastenings. "These can be used to fasten ropes to wooden posts, for temporary barriers, for instance, and later they decompose together with the posts." At the same



Certificates confirm the characteristics of the material of the Alento urns: 100 % pollutant-free, regenerative, CO₂-neutral and perishable.

time, Arboform only releases the quantities of CO₂ that the plants have absorbed from the atmosphere during their growth, in the same way as a combustion process. Furthermore, unlike traditional plastics, the material does not use any petrol-chemical resources. The highly constant quality of the material is due to the lignin in its matrix.

Adapted temperature profile

When searching for a reliable injection moulding procedure for Arboform, Herbert Perschl got in touch with Sumitomo (SHI) Demag Plastics Machinery GmbH in Schwaig. We acquired our know-how in three years of close cooperation with Demag's departments and developed it into our core competence. Even today both companies still put together teams to modify or optimise processes for specific applications.



Alento developed the reliable injection moulding process for Arboform in a close, three-year cooperation with Sumitomo (SHI) Demag.



The shoe tree made of the biomaterial keeps the shoe in shape and discharges humidity

Arboform is injected into a mould at a pressure of 1,000 bar and a temperature of between 110 and 170 °C. "Because the material needs humidity in order to plasticise, which distinguishes it from other natural fibre injection moulding granulates, it does not

need to be dried before processing – despite its hydrophilic character," explains Urs Kocher, consultant and salesperson for MAPAG Maschinen AG in Bern, the Swiss representation of Sumitomo (SHI) Demag. Apart from this, you need approx. 30 % less

energy than in the case of conventional plastics as the temperature profile of Arboform is significantly lower.

On his walkabout Perschl stops in front of a machine. "The main challenge was to process natural fibres with standard injection moulding machines. Sumitomo (SHI) Demag has designed a universal machine, the Systec 200-1450 with a clamping force of 2,000 kN, for all corresponding materials available on the market." The injection profile, for example, has been adjusted (by making changes to the speed and the pressure) along with the temperature profile. Furthermore, process technicians have defined what characteristics specific to the material have to be taken into account when manufacturing the moulds and how the process is to be adapted to the proportion of fibres and the product. In accordance with the characteristics of the material, the process requires better ventilation of the mould, for instance.

Modified plasticising unit

In order to avoid thermal damage to the sensitive biomaterial, gentle handling is required during the melting process in the plasticising cylinder. A screw geometry appropriate to these requirements, including a long compression zone with adjusted compression, a special non-return valve and a surface coating to avoid corrosion and deposits, ensures a constantly high melting quality. Perschl continues: "While the reject rate was 80 % at the start of the project, it has now fallen to below 1 %. And the development is by no means completed. This is shown by the fact that we are now able to back-inject biofoils when using Arboform."

Market success is just a question of time

At € 4.50/kg Arboform is more expensive than mass plastics, but considerably less expensive than high-performance plastics, which currently cost between € 6 and 20/kg. According to market studies, it is only a question of time until Arboform and similar materials conquer the market. This is also because the price should fall in the coming years as production volumes grow and the costs depend on the price of crude oil. Another reason is that many customers are placing increasing emphasis on the sustainability of a material in their marketing strategies.

Manfred Zoß is optimistic in his assessment of the market prospects for the cremation urns. "We have already reached the contribution margin for the development of the urns. And we have done this without any kind of subsidies. With some 500,000 cremations each year in Germany alone some interesting prospects emerge. We specifically address crematoriums and municipalities and try to awaken their interest." That of the city of Nuremberg, for instance. Those responsible there have calculated that if they change to Alento urns at their crematoriums they would no longer need to dig out anything at the end of the resting time for the dead and could therefore significantly lower their costs.

Apart from this, Alento is supported by the University of St Gallen in its search for new applications and markets. Further materials from Tecnar also open up new prospects. One of them is Arboblend which is similar to impact-resistant plastics in its mechanical properties and is made from renewable raw ma-



Urs Kocher from the Swiss representation of Sumitomo (SHI) Demag, with Herbert Perschl and Manfred Zoß, both from Alento AG (from the left), expect an attractive market for products made of the Arboform biomaterial

The BioStruct Research Project

For Alento AG of Widnau/Switzerland, formed in 2005, the development and production of both plastic products and natural products made of liquid wood are among its core competences. Alento is also one of 20 partners from ten European countries that are taking part in the joint **BioStruct research project** which has a total budget of around € 10 million and which is subsidised by the European Commission. The aim is to develop the next generation of wood and cellulose-fibre-reinforced composites, known as **enhanced wood plastic composites (eWPCs)**. Alento is in charge of application development and industrial case studies. The case study phase is currently underway during which interior components for the motor car industry made up of 90 to 100 % biomaterial will be produced.

terials. The most recent member of the product family is Arbo-
phonic: Herbert Perschl then shows the mouthpiece of a flute made from the acoustically optimised material. ■

The author

Dipl.-Ing. (FH) Thomas Brettlich
Head of Technical Development





Medical technology attracts processors

This constantly growing sector attracts many newcomers, but also makes high and varied demands.

Processors from the crisis-ridden automotive industry are currently pushing into the market for medical technology. Experience shows, however, that the failure rate is high if a short-term decision is taken and there is no long-term planning. This is what Jens Löwe, Cluster Manager at Medi-

Jens Löwe, Cluster Manager Medical at Sumitomo (SHI) Demag Plastics Machinery GmbH



cal Sumitomo (SHI) Demag Plastics Machinery GmbH has found. He says that the hurdles resulting from special legislation and the specific expertise that is required are hard to take. Not to mention the financial health that a processor has to show in order to enter the market, but also year for year as an experienced cleanroom producer. For it is a matter of keeping constantly up to date by making one's own investments in cleanrooms. Ultimately, it is therefore the innovative power and investment strength of an enterprise that decides whether or not it is successful. That the health market continues to grow is also suggested by the positive figures of the industry association Spectaris, which expects growth rates of 6 %. But plastics processors should nevertheless avoid being naive when entering this market, warns Jens Löwe.

The sales figures of German manufacturers of injection moulding machines who in 2008 sold around 950 all-electric injection moulding machines in the field of medical technology alone cast a little light on the matter. In crisis year 2009 they still managed to sell 750 machines. While manufacturers of injection moulding machines sold around 40 % fewer machines in total in 2009, medical technology was much more crisis-resistant with a decline of 30 %. However, if the economic situation is good in 2010 machine manufacturers reckon with more than 1,000 injection moulding machines for this exciting market.

That the proportion of plastics in medical technology is increasing is due to the almost unbeatable advantages of polymers. The diversity of applications for plastics in medical technology has now become almost inestimable.

A division of the products into “devices” and „consumables” has proved expedient. “Devices” generally means components for equipment, whether these be housing parts for analysis facilities, dialysis equipment, miniature engines or measuring equipment for diabetics, to name just a few examples.

“Consumables” on the other hand designates the huge market of consumable articles. Some examples are inhalers, contact lenses, including the cases for day lenses, syringes, laboratory supplies such as pipettes, cuvettes, petri dishes, caps and stoppers and serum containers, infusion sets, blood bags and medical tubes.

The demand for disposable syringes by itself is gigantic. The figures are said to be between 20 and 30 billion disposable syringes worldwide each year. It should also be remembered that a disposable syringe has a plunger, cylinder, needle holder and protector that are all made of plastic. Another point is that these lists do not yet take account of the innumerable implants. But caution is advised. Although the market is enormous, the requirements made of producers of syringes, for example, are extremely

tough. The product can only be produced at a profit if the sales figures are high. Competition is also becoming more intense in the field of medical technology and customers are increasingly asking for „just enough concepts” in order to make production as economical as possible – particularly in the case of mass articles.

Qualified partner for newcomers

It is particularly important for newcomers to the medical technology market to ensure that they have the support of a competent partner. For injection moulders, for example, it is sensible to work together with the supplier of the machine. The reason is that the production facilities for the manufacture of medical parts need to meet certain criteria. However, this not only concerns the machines and the facilities themselves, but also their production. In other words: The quality assurance process starts with the supplier. From the processor’s point of view – and limited to the production plant – i.e. in the case of the machine supplier, who then has to impose an obligation on its own suppliers. The key word here is “qualification”. This means that

the manufacturer has to prove that its injection moulding machines, for example, are fit for purpose and meet the quality assurance requirements. This involves mandatory and very comprehensive documentation. The same naturally applies to all other components of a production unit; in the case of a manufacturing cell it also applies to the robot or the conveyor belt.

Sumitomo (SHI) Demag has set up a comprehensive strategic programme for the qualification of its machines and their manufacturing processes. To put it very briefly, this means a tightly organised and certified quality assurance programme where only components from audited suppliers can be fitted in the machines. Detailed procedural instructions guarantee an orderly and smooth production process which is monitored and documented through process monitoring. The incoming goods department, for its part, has to very carefully check everything for conformity and keep a record of the results. The assembly of

The all-electric injection moulding machine IntElect 50-45 with a clamping force of 500 kN – here with laminar flow module over the mould area for the production of medical precision parts.



From the specification to quality

Injection moulding machines have to meet many criteria for application in medical technology. Sumitomo (SHI) Demag supports processors with a sophisticated and certified procedure that is rigorously based on a qualification scheme.

On the basis of the market requirements a **specification** is first developed with the customer **in relation to requirements**. On this basis the next thing is to formulate **functional specifi-**

cations which are the precondition for the construction of a machine or a machine component. The procedure after that is similar way to the systematic qualification phases now prescribed by the rules and regulations and which have to be documented: There follows the **“design qualification”** phase which serves to prove that the machine was designed in accordance with the requirements regarding construction and features. It also needs to meet the requirements of general quality assurance and of environmental and industrial safety.

With the **“installation qualification”** it is proved that the machine has been designed, built and installed in accordance with the specifications, installation rules and other rules and regulations. After that comes the **“operational qualification”** as the first functional test of the injection moulding machine. It is tested whether the machine works as planned.

Finally there comes the **“performance qualification”**. It provides evidence that the machine works and produces under operational conditions as planned.

the injection moulding machines is carried out in precisely defined steps. Finally, all machines pass through the final inspection, which is also defined.

The machines are finally delivered together with all inspection reports. The processor needs this documentation by the time of the acceptance test at the latest so that it can be presented to the customer.

When processing plastics to produce medical products, special environmental conditions have to be observed in nearly all cases. Among the important standards are the Good Manufacturing Practice guidelines of the EU Commission and further guidelines, standards, rules and agreements that govern the production of products for medical and pharmaceutical purposes under cleanroom conditions. A fundamental requirement for the production for medical products, for example, is that the air in the production rooms must be clean. The degree of purity is mainly determined by the type of product to be produced. The

consideration of process risks ultimately determines which cleanroom concept is necessary, expedient, natural and also economical for the product to be manufactured.

In addition to the classical concept of installing a complete injection moulding machine in a cleanroom, there are a number of smart cleanroom concepts:

- > injection moulding machines with a laminar flow module over the critical process area, the mould,
- > connection to an injection moulding machine via an encapsulated conveyor belt to a cleanroom,
- > a cleanroom cell with a 6-axis robot and a double-deck conveyor belt to the flexible cavity-sorted stacker,
- > a cleanroom cell, mobile and selected via the clamping unit,
- > a clamping unit of the injection moulding machine as a “small cleanroom cell” with automation.

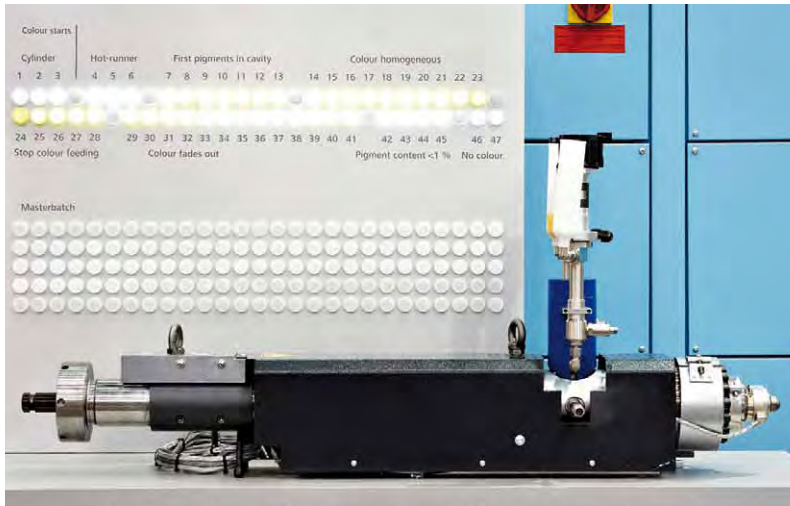
With its product portfolio Sumitomo (SHI) Demag is well positioned for medical technology,

as Jens Löwe emphasises. The all-electric injection moulding machine, IntElect, which is equipped with internally manufactured drives, offers sophisticated and reliable technology, developed by the Japanese parent over decades and sold many thousands of times. The drives and converters have been specially developed for use by injection moulding machines and offer a high degree of reliability and precision. Today the machine is used for clamping forces of 500 to 4,500 kN.

At present the El-Exis SP is the fastest injection moulding machine and also one of the most economical in its class due to its unique concept. In the clamping force range of 1,000 to 7,000 kN it impresses by its sophisticated, tried and tested concept, which guarantees a high degree of availability. It is mainly used for packaging applications and a large number of cavities with high clamping forces. All machines can be equipped for cleanroom production with only few optional features – in line with the “just enough” principle. ■

Rapid colour changes without losses

Study of activeColourChange combines liquid colouring and standard plasticising



Prototype on a laboratory scale, shown for the first time at the K 2010 in Düsseldorf

Whether it's yellow, red, green or blue: the homogenous colouring of plastic parts is not an easy task in injection moulding. Today more than one third of all thermoplastic products manufactured are coloured or decorated – for example through a coating process. And the trend is rising!

In cooperation with partners, Sumitomo (SHI) Demag is developing a liquid colouring system for injection moulding machines which combines the advantages of liquid colour with those of standard plasticising. The core idea is that the colour is not ap-

plied to the plastic until it is already liquid. This not only saves time, energy and costs on colour changes, but separates the melting operation from the colouration process, thus allowing a very constant metering process with full plastification and without smearing the worm. What is so ingenious about this approach is that with the closed system nobody comes into contact with the liquid colourant. One press of a button and the machine automatically switches over to the new colour tone. A specially developed system, activeColourChange, which is closed and

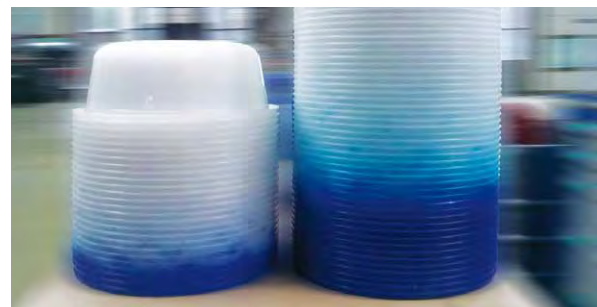
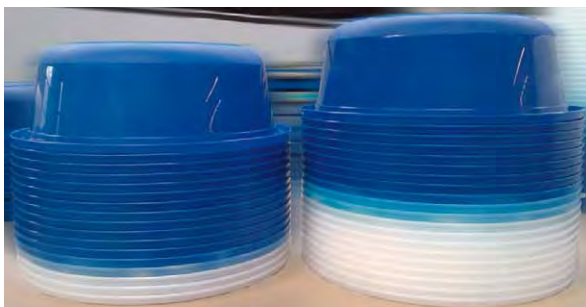
specially adapted to the injection moulding process, dispenses liquid colour during the plasticising phase in the front part of the injection cylinder. With the aid of the endless piston principle, even tiny amounts of colour can be very constantly applied to the melt on counter-pressure. An adapted mixing element homogenises the mixture and very quickly provides the coloured plastic for the injection process.

activeColourChange is a colouring system

- > that allows very rapid colour changes,
- > without having to halt the machine,
- > without having to adjust the parameters,
- > that separates the plasticising process from the colouring process,
- > that avoids direct contact with the liquid colourant,
- > that can apply the colour pigments in a highly concentrated form and that helps cut costs. ■

Author

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Technical Development



Colouring with activeColourChange (left tower) and Masterbatch (right tower) from white to blue (left) or from blue to white (right)

Great confidence in Demag Hamilton

More than 50 years of success with German machines in the British market

When a bell rings through the stairway into all offices in Aylesbury, then Demag Hamilton Ltd. has just won an order for a new injection moulding machine. This has been the ritual many thousands of times since 1957. And it has continued to this very day through all name changes and moves of the British branch of Sumitomo (SHI) Demag.

In 1957 Hamilton Machinery Sales took on the representation in the UK and Ireland of the injection moulding manufacturer, Ankerwerk Gebr. Goller GmbH from Nuremberg. At the time the company represented the machines of Stübbe from Mortimer Machine Tools Ltd. With the integration of Ankerwerk and Stübbe, Demag AG formed a joint venture with Hamilton Machinery Sales in 1974 in order to sell both product lines in the UK through a joint distribution struc-



Nigel Flowers, Managing Director of Demag Hamilton

ture. Under the umbrella of Mannesmann Demag AG the representation finally changed its name to Demag Hamilton Ltd. in 1979.

Today Demag Hamilton is fully owned by Sumitomo (SHI) Demag

and one of the leading importers of injection moulding machines to the British market, accounting for around 15 %. The machines from Sumitomo (SHI) Demag are widely accepted as one of the world's leading brand names. The main area of application for the machines supplied by Demag Hamilton is the production of plastic parts for the automotive, IT and E&E industries, as well as for packaging, medical and pharmaceutical purposes, for construction and the production of sport and leisure-time articles.

Demag Hamilton looks after an active clientele of 200 companies, including well-known brands and large factories: Gillette, Avent, GCS Group, Hozelock, Sovrin and many more. In the UK and Ireland the service team services and maintains more than 4,000 installed injection moulding machines. For its 24-hour

Demag Hamilton, the UK branch of Sumitomo (SHI) Demag





The new injection moulding machine Systec 1300 increases capacity for the new garden hosepipe systems, AutoReel

service for all aspects of the machine Demag Hamilton also arranges comprehensive training courses – from a programme with an annual training calendar up to customised courses held locally. With more than 30 years of experience as the representation of AEC, Demag Hamilton also offers a lot of peripheral technology for the injection moulding machines as well as complete solutions for ready-to-use manufacturing cells consisting of machine and periphery.

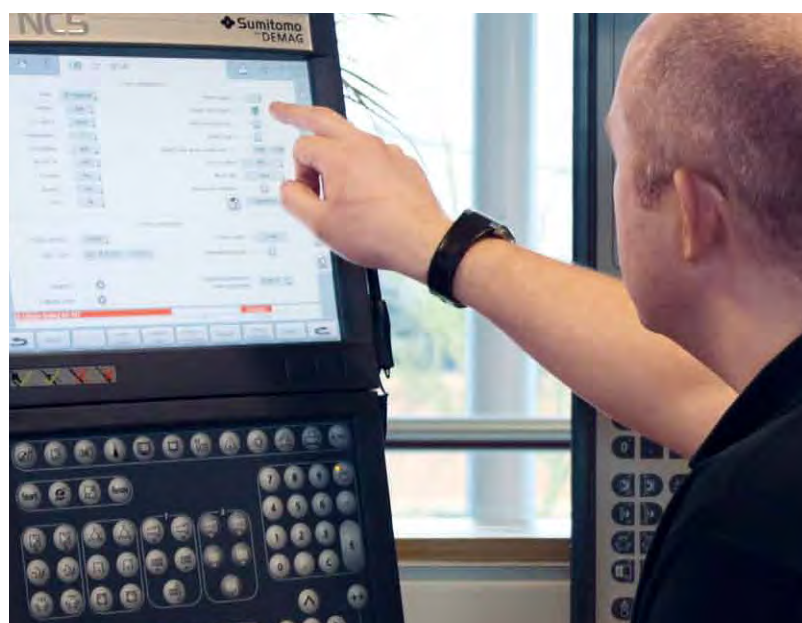
Systec 1300 for Hozelock

Hozelock Ltd., for instance, a major British manufacturer of garden irrigation systems based in Birmingham, installed a Systec 1300 with a clamping force of 13,000 kN at the end of 2010. “The Systec 1300 is the biggest machine we’ve sold in Britain in recent years,” says Nigel Flowers, long-standing Managing Director of Demag Hamilton. “That’s a significant investment for Hozelock and a particular pleasure for me after 25 years with Sumitomo (SHI) Demag.”

The investment of more than € 1 million in the highly modern Hozelock factory in Midpoint Park in Birmingham will significantly shorten delivery times for the automatic “AutoReel” hosepipe systems. The injection moulded plastic housing of the new AutoReels for wall assembly have a diameter of more than 60 cm and can accommodate garden hoses of up to 30 or 40 m in length. The new Systec 1300 increases production capacity for these models by more than 1,800 units a day.

The Systec, which weighs 87 tonnes, is equipped with an ATM ES3000 HS removal robot. In addition to the AutoReel production, the machine, with its shot weight of more than 5 kg, is also used for the production of other forward-looking products that require larger moulds or multi-moulds, thus making additional smaller machines superfluous. ■

Service and application support supplement machinery and peripheral technology at Demag Hamilton





IntElect – The Precise Machine

***„If you want to manufacture with
0% defects, you must be able to rely
100% on your machine.“***

Dr. Joachim Franke, Managing Director Healthcare, forteq Nidau AG
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