

ENGEL VICTORY Standard

>> Making its debut on Engel's stand at Fakuma – Stand 5204, Hall A5 – will be the new ENGEL VICTORY Standard 200/50 (500 kN clamping force). Its engineering is a logical development of the meanwhile very familiar tiebarless series of injection moulding machines, and yet at first glance it looks completely different – “fresher”, more “modern”. This is certainly ascribable to the machine's “futuristic styling”, the most conspicuous feature of which is the new safety shield around the clamping and injection units: outward curving, all-glass doors – like the doors and windows of a modern car – have now replaced the flat panes and their metal frames in “Engel green”.

But that is only the outside. What about the inside? – The ENGEL VICTORY Standard 200/50 is the first representative of the VICTORY series to be equipped specifically for standard injection moulding applications, as the suffix “Standard” indicates. This standard version will henceforth complement “Tech” and “Power”, the two other, well-established versions of the ENGEL VICTORY.

An economical tiebarless machine for standard applications

Engel's purpose behind this new standard machine configuration is to make the well proven advantages of tiebarless technology (see “Freedom + Precision” on page 7 of this issue of “injection”) also available to manufacturers of standard injection moulded parts in the form of a tailored and particularly economical equipment package. Not all the “high-performance features” offered on a modern injection moulding machine are needed for standard applications and “only cost money anyway”. To this end, Engel has sorted through its VICTORY modules – both the hardware and the software – and come up with a standard machine configuration which, being of the same basic modular design, naturally features the same high quality of materials and workmanship as an ENGEL VICTORY Tech or an ENGEL VICTORY Power.

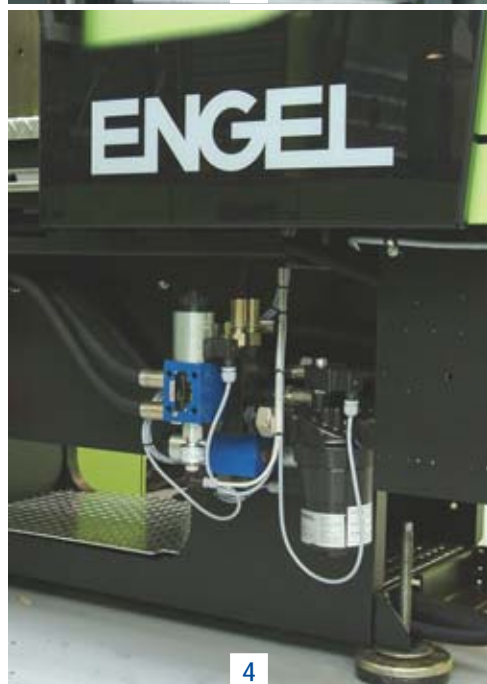
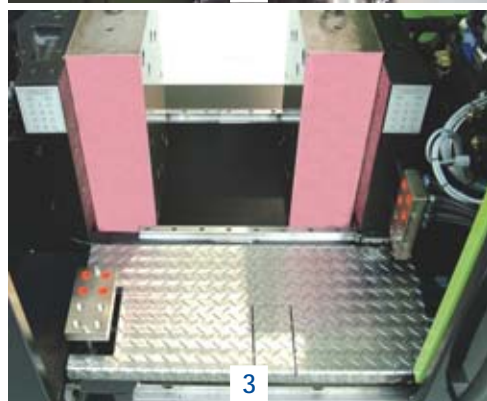
The hydraulic system of the ENGEL VICTORY Standard is equipped with variable delivery pumps for sequential operation. It has a suitably optimized control system, the “EC 200”, which is based on the new Engel CC 200 control system with intuitive touch-screen interface, but adapted to the requirements of standard injection moulding. The

The ENGEL VICTORY Standard in closer detail:

- 1: The new injection unit is of modular design and the moving masses have been reduced.
- 2: The platens are of new design, lighter in weight and optimally strengthened against deflection. This contributes considerably to a reduction in the overall weight of the machine.
- 3: Integrated media hose connecting plates in close proximity to the platens, with ample space on all sides for routing the hoses.
- 4: Ease of operation and maintenance: the hydraulic system is readily accessible via a central door. The oil filter is easily and immediately accessible, as it is located outside the safety guard, underneath the injection unit.



Only four weeks' delivery



EC 200 is of course completely compatible with the CC 200, i.e. the machine settings of the standard machine (EC 200) can be transferred one-to-one to a VICTORY Tech (CC 200), for example.

The benefits and user-friendliness of Engel's tiebarless technology have again been improved for this standard version. Both the floor space requirement and the weight of the machine have been reduced, while the maximum daylight between the platens and their maximum opening stroke have been increased in order to accommodate large and awkwardly shaped moulds more easily. The pictures on this page show and explain some of the many other examples of improvement. Nonetheless, the “Victory Standard” version still costs less than a “Victory Tech” version of comparable clamping force.

>> The ENGEL VICTORY Standard 50, for example, costs around 10% less than a roughly comparable ENGEL VICTORY Tech 45.

ENGEL VICTORY Standard – delivered in four weeks

This standard machine also represents the achievement of another aim of Engel's production improvement strategy: the ENGEL VICTORY Standard is a genuine “four week machine”, that is to say, it leaves the factory exactly four weeks after receipt of order! That goes not only for the “catalogue standard” but also for the usual optional items of equipment, e.g. mould heating system, core pullers, highly wear-resistant plasticizing unit, electrical connections and automation interfaces, to name only a few.

As the ENGEL VICTORY Standard – like the entire VICTORY series – is modular, it can also be upgraded at some later point in time, provided that the additional functions are within the performance capabilities of the EC 200 control.

The new ENGEL VICTORY Standard is also the new “standard” for the entire VICTORY series. In other words, the new styling and the structural improvements to the clamping unit will be gradually realized on the other versions as well. This means that customers will soon be able to choose between three comparable ENGEL VICTORY machines – in the lower clamping force range – in the versions “Standard”, “Tech” and “Power”.

>> The ENGEL VICTORY Standard will cover the clamping force range from 250 to 1,200 kN. <<

In this edition



>> Page 2: ENGEL SPEED: new, equipped with a highly dynamic toggle clamping unit and a fast, high-performance injection unit – the new Engel high-speed machine for shortest possible cycle times.



>> Page 3: ENGEL ERC 13: Compact, flexible, economical – and ideal for use on small injection moulding machines ranging from 250 to 1,500 kN clamping force.



>> Page 4: Blum – Pfeiffer – WKW-KTR – three highly convinced Engel customers based in the region where three countries meet on the shores of Lake Constance.



>> Page 7: Engel tiebarless technology: freedom of access combined with the highest precision – almost 23,000 tiebarless machines are now in service worldwide.

Supplements

- >> injection Asia
- >> injection North America

Dear Customers,

If a visit to Fakuma is on your list of things to do this autumn, you will certainly come and take a look at Engel's stand in Hall A5. And while you're there, take a special look at the ENGEL SPEED. Why? – Because not only the name is new, the machine is new, too. And what's more, this machine will be shown in action for the first time in public – under "practical stress conditions", as it were.

Admittedly, we already took an intermediate step in this direction exactly a year ago at "K" in Düsseldorf. Perhaps you will remember: the "prototype" was still called ENGEL macPACK. "So it's old wine in new bottles after all", you might say. But no, that kind of "innovation" is not Engel's style. The aim of this new line of machines was, and still is, the fast-cycling injection moulding of the kind of parts normally required by the packaging industry, for example. Indeed, it was precisely to this application that the name first given to the series referred. Since "K", however, our development engineers have revised and improved the original

machine and, in some instances, completely redesigned it. One example is the new in-line injection unit.

Our set aim was at all times to combine highly dynamic movements with maximum quietness of operation. And in this we have succeeded. When competing for the favour of potential users, the ENGEL SPEED need not

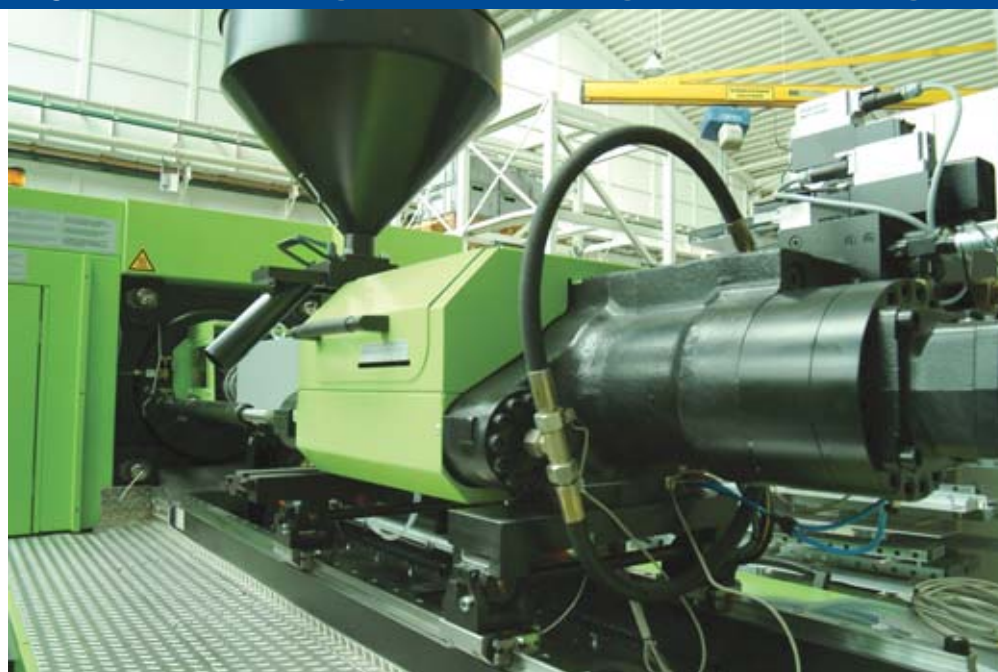
hide its light under a bushel. Quite the contrary. We are convinced that this new machine has set the standards even higher for the fast-cycling injection moulding of thin-walled products, that is to say, for those applications where parts having a high flow length/wall thickness ratio have to be injection moulded in the shortest possible cycle time. And this is more aptly expressed by the name "Speed" than by the name "Pack", especially as not just packaging manufacturers will be enjoying the benefits of this new Engel fast-cycling machine.

Naturally, the ENGEL SPEED also features the modular platform principle which has now been favoured by Engel for quite some time. It permits efficient and economical adaptation to the widest conceivable diversity of applications and requirements. If, for example, a machine configuration with an all-electric injection unit were found to be more suitable for a certain application, the highly dynamic hydraulic SPEED clamping unit could be readily combined with the servo-electric injection unit of our ENGEL E-MOTION series. The result would be an "ENGEL SPEED Electric" – its counterpart among the tiebarless machines being the ENGEL VICTORY Electric, a machine already available as standard.

New and further developments at Engel are traditionally aimed at making the most suitable machines and equipment available to the plastics processor for his particular application – state-of-the-art, reliable, economically efficient. The ENGEL SPEED is one of the results of this continuously implemented corporate philosophy.

Yours sincerely,

Hans Wobbe
Technology Director, Engel Holding



The new inline injection units of the ENGEL SPEED series are capable of the highest injection speeds, as the inline design reduces the mass that has to be accelerated during injection.

The new ENGEL SPEED The "Formula One" of thin-wall injection moulding

>> Since "time is money", the injection moulding of packagings with wall thicknesses of less than 1 mm or thin-walled parts having a flow length-wall thickness ratio of up to 450:1 necessitates the use of high-speed injection moulding machines capable of very short dry cycle times and the highest injection speeds. But time is not everything – smooth and stable operation and high reliability in continuous mass production are absolutely indispensable. These capabilities – as well as many other advantages for the user – are offered by the completely new ENGEL SPEED series of injection moulding machines. Ideal for the production of fast cycling, thin-walled parts – e.g. packagings, medical equipment parts, mobile telephone housings –, the new series of toggle clamp machines covers clamping force requirements from 1,350 to 6,500 kN.

The toggle clamping system was chosen for its high dynamic capabilities. It displays high rigidity at all its force transmission points and permits high mould opening forces in the region of 10 to 15 % of the clamping force, these being necessary for parts featuring negligible draft and/or undercuts, e.g. tubs and similar bucket-shaped containers.

The entire hydraulic system is rated to cope with the highly dynamic movement of the clamping unit and the high injection speed of the injection unit. All machine movements are actuated via a central hydraulic accumulator working in conjunction with highly dynamic valves.

Toggle clamping unit – highly dynamic movement for fast cycling

The toggle clamping unit – the central module of the new ENGEL SPEED – has been newly developed for high-speed applications. The chief and equally important objectives of this new development were cycle time reduction and extreme quietness of operation.

For the quietness of movement of the heavily laden moving platen, and hence for the quietness of the entire injection moulding machine, the harmonious sequence of all movements and, by the same token, the kinematic action of the toggle clamp is of decisive importance:

>> During the dynamic phase of the mould opening or closing movement, the transmission ratio between the crosshead

speed and the platen speed must be as constant as possible. In contrast to conventional systems, the constancy of the transmission ratio enables the toggle clamping system of the ENGEL SPEED machines to perform a sequence of movements during this dynamic phase without any sign inversion of the acceleration gradient. Moreover, the transmission ratio remains more or less constant within a large stroke range, ensuring an optimized sequence of movements independently of the opening stroke.

>> At the end of the mould closing movement, the transmission ratio rises steeply, the crosshead speed remaining constant while the platen speed decelerates rapidly. For the toggle system to lock of its own accord, the crosshead must travel a relatively long way, which costs time. In order to save this time, especially during the mould closing operation, the toggle does not move all the way to its self-locking position. Instead, part of the clamping force is transmitted to the mould permanently via the crosshead (i.e. the clamping cylinder).



An integrated friction clutch transmits the torque – without stress concentrations – from the drive to the screw.

It goes without saying that the braking and accelerating ramps for the moving platen have been optimally adapted to the new toggle geometry. The combination of all dynamic-related measures has resulted in extremely short dry cycle times:

>> Depending on the size of the machine, the dry cycle time of the ENGEL SPEED is between 1.1 and 2.2 seconds.

The moving platen guide system has a special feature which ensures that the area around the mould remains free from oil, a very important aspect for many applications: the tiebar

The combination of a newly designed, highly dynamic toggle clamping system with a fast, high-performance injection unit is the basis of a completely new injection moulding machine for extremely short cycle times: ENGEL SPEED, a series of six new fast cycling machines, covers clamping force requirements from 1,350 to 6,500 kN. These machines are of particular benefit to manufacturers of packagings and other thin-walled parts.

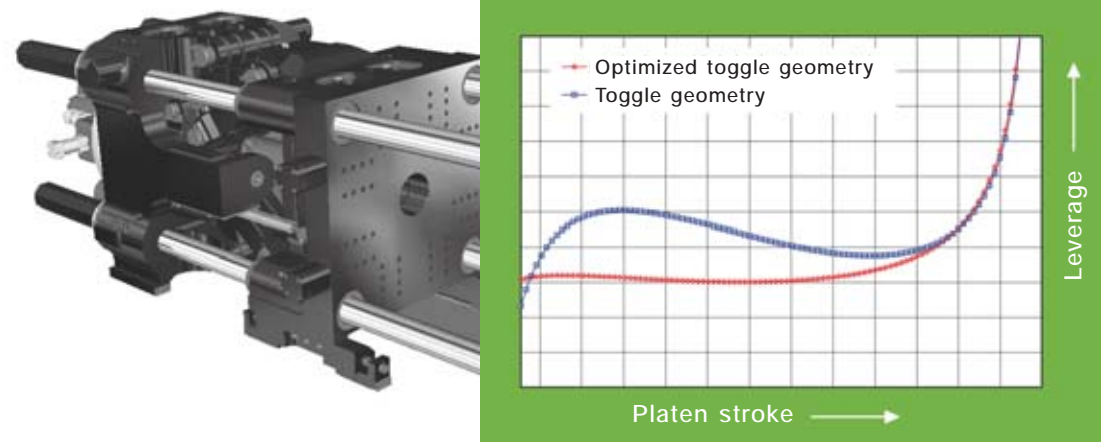


boreholes in the platen are larger in diameter than the tiebars. In other words, the tiebars have no direct part to play in the platen guiding operation. Instead, the moving platen runs on a guide carriage mounted on the sturdy machine frame. The guide unit extends well beyond the platen, ensuring that even in the case of large, heavy moulds no adverse tilting moment can occur.

>> The machine frames, toggle clamps and platen guides of all machines of the ENGEL SPEED series are so dimensioned that both maximum achievable precision and minimum required maintenance are guaranteed for continuous operation.

In order to exploit the dynamic advantages of the toggle clamping unit over the long term, those joints of the toggle clamp that are subjected to friction must be regularly maintained. Of decisive importance here are an optimum combination of materials for the bushes and pins and a lubricating procedure optimized in respect of quantity and frequency. The result: negligible frictional loss and very good reproducibility under continuous operating conditions.

Whilst the safety covers of the new toggle clamp machines are in keeping with the tried and tested design concept of Engel's other machines, they have naturally been adapted to the special requirements of fast cycling machines. The open design of the injection unit facilitates access. The modular safety hoods feature integrated conduits and ducts which are amply dimensioned for all necessary, application-specific supply lines, e.g. compressed air and cooling water.



When performing the mould closing stroke at high platen speed, the new five-point toggle clamp displays a virtually constant transmission ratio (red curve) and therefore runs much more quietly than its predecessors (blue curve).

Even more dynamic: new inline design of injection unit

The new injection units were developed with due attention to the necessary performance standards for thin-walled parts having a high flow length-wall thickness ratio. It was not the injection volume which took priority, but



rather the need for a high plasticizing capacity and a high injection speed. The geometry of the barrier screws chosen or the plasticizing process was optimized for the processing of typical packaging plastics such as polystyrene (PS), polypropylene (PP) and high-density polyethylene (PE-HD). Rotating at peripheral velocities of up to 1 m/s and over, they achieve a high rate of feed and at the same time ensure a gentle treatment of the melt.

In order to operate at the necessary high rates of injection, the injection units are of inline design. The arrangement of the component units is such that the hydraulic screw drive and its rotating plunger are located in the extension of the screw axis. Transmission of torque to the screw is effected by an integrat-

ed friction clutch, thus eliminating the stress concentrations (notch effects) normally associated with positive clutches.

Although this design of injection unit increases the overall length of the machine, it considerably reduces the mass that has to be accelerated during injection. The new inline injection units achieve screw advance speeds of over 1000 mm/s.

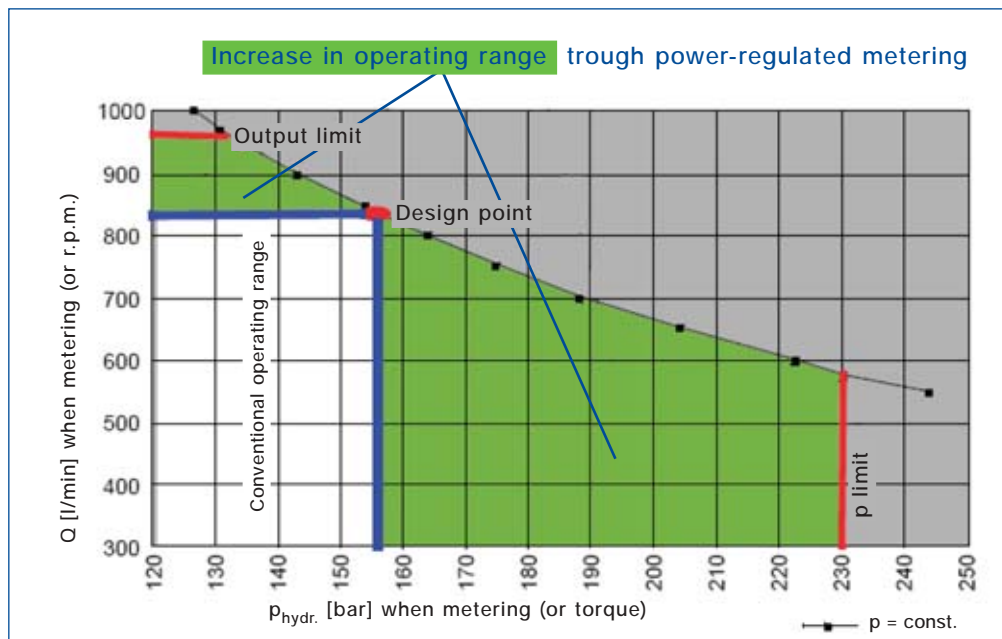
The injection units have been specially designed to perform the short metering strokes required for packagings and thin-walled parts, and it goes without saying that the necessary injection pressure of over 2000 bar can be achieved with all screw diameters. The inline injection units can be swung out, thus permitting fast and easy changeover of the plasticizing cylinders and, by the same token, increasing the versatility of the machine.

These new inline injection units are optionally available with electric screw drives. This option enables the user to obtain even higher screw speeds and feed rates than the high values already achievable with the standard hydraulic versions – e.g. for the production of screw caps.

Metering on both the hydraulic and the electric versions is power-regulated, a feature which permits an increase in the potential operating range of a machine beyond its design point.

The new "fast cycler" from Engel recently made its debut at Fakuma in Friedrichshafen: an ENGEL SPEED 275/55 (2,750 kN clamping force) demonstrated the production of yoghurt goblets in PP on a six-cavity mould from Systec Komplettsysteme GmbH, Bad Urach/Germany. The production cell was equipped with standard peripherals from Engel: a high-speed ENGEL ERS 1 robot (Speedy) for parts removal, and an ENGEL ERC 13 for stacking the parts in cartons:

>> The total cycle time, including parts removal, was less than 3 seconds. <<



Power-regulated metering on the ENGEL SPEED increases the useful operating range.

With a reproducibility of ± 0.05 mm, the small ENGEL ERC 13 robot operates extremely accurately and, naturally, round the clock. Ideally combinable with the tiebarless machines of the ENGEL VICTORY and ENGEL E-MOTION series, it is also available as an integrated "Servo-HLi" version.



The new ENGEL ERC 13 Compact, flexible, economical ...

... and ideal for use on small injection moulding machines ranging from 250 to 1,500 kN clamping force.

>> Now available as standard, the ERC 13 robot rounds off Engel's range of robots in the lower clamping force range: the ENGEL ERC series now completely covers standard robot requirements for the entire available range of injection moulding machines from 250 to 55,000 kN.

ERC 13 – the economical pick & place robot

In order to combine system advantages with cost benefits, the design engineers at Engel Automatisierungstechnik GmbH subjected every single component of this small robot



The Z-axis of the new ERC 13 features a noise-reducing, flexurally and torsionally rigid profile. Also new is the space-saving guide trough for the media hoses inside the profile.

>> The compact design – especially that of the extremely slim Y-axis and its likewise compact and slim swivel axis (C-axis) – necessitates only a short mould opening stroke for removal of the moulded part.

>> Available as standard are two pneumatic circuits which can be switched as required to vacuum or compressed air mode; quick-release couplings facilitate and speed up gripper head changeover.

>> X-, Y- and Z-axes are driven by servo motors and can be operated simultaneously.

>> The speed of the Z-axis is 2.5 m/s (on standard versions with strokes ranging from 1,040 to 2,960 mm), that of the X-axis is 1.5 m/s (300 / 400 mm stroke) and that of the Y-axis is 3.5 m/s (400 / 600 / 800 / 1,000 mm stroke).

>> Included in the optional accessories are axis extensions, a pneumatic B-axis, two additional vacuum and/or compressed air circuits and a central lubricating system for low-maintenance operation.

>> The optional B-axis has no adverse affect on the maximum handling load (3 kg). Like the C-axis, which is also pneumatic, it has a torque of 5 Nm. Working at an angle of rotation of 90°, it is used for the grid-pattern placement of parts and, at an angle of 180°, effects the changeover from one demoulding side to the other.

The robot control system is available either as a machine-integrated RC 100 control system or as a stand-alone control (RC 511), the latter being used, for example, when the robot is mounted on a non-Engel machine. The integrated version achieves faster synchronization of robot and machine movements through the use of internal bus connections between the respective control systems. This in turn makes for the fastest possible cycle times.

>> The new "small" ENGEL ERC 13 is a high-speed universal robot for all handling tasks in and around the injection moulding machine – and at a very economical price-performance ratio, too.<<

to a careful analysis. The result is a small, high-performance robot with an enormously economical price-performance ratio. Hardened and precision-ground guides on a newly developed aluminium frame structure working in conjunction with high-precision drive technology not only ensure high positioning accuracy but also high speeds and high durability and stability.

Performance features at a glance:

>> Utilizable on all makes of injection moulding machine with low clamping forces (250 to 1,500 kN) for the handling of parts weighing not more than 3 kg.

>> The lightweight aluminium structure reduces the load on the injection moulding machine; the axis profiles (X, Y, Z) are specially designed for optimum flexural and torsional rigidity.





Blum: The "supplier to the furniture industry with the focus on the kitchen" has set standards for hinge, drawer, pull-out and, more recently, flipper door systems in respect of ergonomics and perfection of movement. Blum is one of Austria's largest patentees and currently owns a good 1,000 patents. A more recent example is BLUMOTION, a system which ensures the gentle and silent closing of doors and drawers irrespective of their weight and/or load (photo on right).

Pfeiffer: Spray and dispensing systems from Pfeiffer – with many awards to their credit – always ensure that ...

Three countries – one theme: Engel high-tech

1 Julius Blum GmbH Kitchen furniture fittings: quality of motion is quality of life

>> "Blum manufactures fitting systems for kitchen and other furniture, that is to say, hinge, drawer, pull-out and flipper door systems. We want our products to inspire our customers. We are an international company."

These three sentences are the introductory words "about Blum" on this company's website (www.blum.com), but they give us only an inkling of the capabilities of this internationally renowned, family-owned company. Today, the Blum Group employs over 4,200 people worldwide and has production facilities in Austria, USA and Brazil. All over the world, Blum products help to make furniture more comfortable and emotionally appealing. The group is still based in Hoechst in Austria's Vorarlberg region, on the shore of Lake Constance, where the company's success story began over 50 years ago. The company's attachment to the Vorarlberg is reflected not least in the fact that six of its current total of eight production sites are located in this beautiful region of Austria.

The cornerstone of the company's history was laid by Julius Blum, an iron fitter and blacksmith, when he founded the firm of Julius Blum GmbH in Hoechst in 1952. His first products were anti-slip horseshoe studs. After the first few years of very successful business, Julius Blum had a stroke of luck which marked the subsequent rapid growth of the company: he received the licence to manufacture the so-called ANUBA spigot hinges for doors, windows and furniture in Austria. That was the beginning of the company's business in furniture fittings.

Encouraged by this success, Blum began to develop his own products: 1964 saw the introduction of the first Blum hinge, an innovative concealed furniture hinge affording completely new possibilities in furniture design. The production of drawer runners commenced in 1966. Continuing success soon made it necessary to extend the factory at Hoechst, and then to build new factories and to establish sales agents and distributors abroad, first in Europe and then all over the world. New product systems – mainly for kitchen furniture – were developed and successfully marketed.

Blum attaches the utmost importance to design, function and comfort. The motivating force behind all innovative developments is always the potential benefit to the user. Here are just a few examples which reflect this philosophy: the CLIP hinge for tool-free mounting saves the kitchen fitter as much as 60% of his time. The Blum full-extension drawer system permits optimum and ergonomic use of storage space, as the entire contents are visible and readily accessible when the drawer is open. The "floating" characteristics of the TANDEM runner system make even heavily laden drawers and pull-outs operate almost effortlessly. And one of the most recent innovations – BLUMOTION – ensures the gentle and silent closing of drawers, pull-outs and doors. A new type of motion – a completely new experience!

What does all this, you might ask, have to do with plastics? – Quite a lot, in fact. The silent, gentle opening and closing action of a drawer could not be achieved with metal runners and rollers. And the same goes for their service life, too. Blum hinge, drawer and pull-out systems are made to last the lifetime of the furniture they are used on. And in the case of kitchens, for example, an average lifetime – according to statistics – is at least 20 years.

And so Blum is also a plastics processor on a large scale. As many as 75 injection moulding machines currently produce parts in high-grade engineering plastics, such as PA (generally glass fibre reinforced), POM, ABS or TPU. These conventional and multi-component high-precision parts in turn demand extremely high precision and reproducibility on the part of the machines that produce them. – And that the "chemistry" between Blum and Engel could not have been better is proven by simple facts and figures: the first Engel machine was delivered in 1991 – meanwhile over 60 of the 75 machines have come from Engel, including the two-component and all-electric machines.

Modern "high-tech kitchens" owe their high functional efficiency not least to the innovative systems from Blum in Austria's Vorarlberg and, by the same token, to Engel injection moulding machines from Upper Austria.<<

2 Ing. Erich Pfeiffer GmbH Medical equipment technology: innovation through tradition

>>The second company on our visiting round is Ing. Erich Pfeiffer GmbH (www.pfeiffer.de). Pfeiffer employs around 700 people worldwide and is based in Radolfzell on the German side of Lake Constance. Our own journey, however, takes us to Eigeltingen, 15 km from Radolfzell, where the company concentrates its Pharma Division. Its main products are spray and dispensing systems, primarily for nasal, oral and topical drug administration. Pfeiffer's customers include the world's ten largest pharmaceutical groups.

Besides observing ISO standards, Pfeiffer operates according to the pharmaceutical industry's highly stringent rules of Good Man-



For the 17th time, from 18th to Friedrichshafen will again be plastics – a good enough reason Engel's customers in this region shores of Lake Constance.

ufacturing Practice, that is to say, it has full control over all stages of processing and production – every single part produced is completely retraceable. As many as 20 customers perform audits at Pfeiffer every year, making sure that these GMP rules are fully observed during the day-to-day production of their products.

Pfeiffer products enjoy high acceptance. Indeed, this has been a tradition ever since the engineer Erich Pfeiffer founded the company in Buchloe/East Allgäu in 1947. During the 1960s, he developed the first leakproof dispensing pump and launched the world's first nasal spray pump in 1972. Further develop-



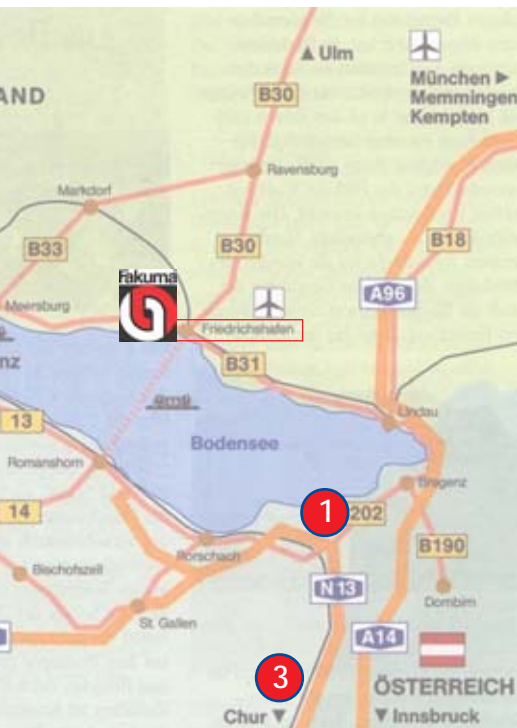
Blum: The Engel machines cover requirements from 250 to 3,000 kN and must meet the highest demands of precision and reproducibility in mass production. A typical example are the tiny disks in TPU (centre photo) which make a vital contribution to the operation and service life of the BLUMOTION system. These sprueless parts are produced on an all-electric ENGEL E-MOTION 80/55 in a 32-cavity mould with full hot runner system and demoulded and sorted by an ENGEL ERC 33/1-EH.

Pfeiffer: Clean surroundings are an absolute must for the production of pharmaceutical products. To this end, every injection moulding machine at Pfeiffer is fed by a dust-free, totally enclosed material feed system (photo on left). The machines generally ...



... patients take their medicines in exactly the right dosage. The "user-independent" nasal spray atomizer (photo on right) is just one of many of Pfeiffer's innovations.

WKW-KTR: Countless plastic parts made to meet the high precision and surface requirements of the automotive industry leave WKW-KTR's production facility in Rütli every year. WKW-KTR also specializes in the development and production of optimized fixing systems – from clips to adhesive tapes.



range of dose volumes, with and without dosing pumps. Pfeiffer always thinks "one jump ahead" – a philosophy resulting in, among other things, a spray system which always dispenses the correct dose volume no matter how it is actuated by the user. Another example is a multi-dose system for the dispensing of preservative-free solutions (nose sprays, for example, have hitherto always contained preservatives). An integrated microbiological filter now ensures that the air which is sucked into the system each time it is used is not contaminated by bacteria.

Such spray and dispensing systems generally consist of around ten plastic parts plus a metal spring and a small metal ball which serves as a non-return valve. Almost all of these plastic parts, which are injection moulded in PE, PP and POM, are high-precision parts. This is why Pfeiffer also manufactures all functionally important parts itself, that's a good three quarters of all plastic parts. Total annual production is in the region of 1.8 billion parts weighing anything between 30 mg and several grammes. In-process measurements are an absolute prerequisite, as mating and operating tolerances are extremely tight. All moulded parts are sorted automatically according to cavities. As many as 400 active moulds are in use at Pfeiffer, mostly multicavity moulds (up to 96 cavities).

Tolerances to within just a few hundredths of a millimetre are not easy to maintain with a mass-production polymer such as PE. Not only are batch-to-batch consistency and high-precision moulds the order of the day, but the injection moulding machine, too, must make its contribution. In 1994, Pfeiffer purchased its first Engel machine in order to "give it a try". Today, out of a total of 78 machines (350 to 1,500 kN clamping force), as many as 26 Engel machines are giving continuous, trouble-free and extremely reliable service. In everything it does, Pfeiffer observes its corporate principle of putting the satisfaction of its customers first and foremost. And to this end Pfeiffer will continue to put its trust in Engel machines. <<

WKW Kunststofftechnik Rütli AG Automotive technology: pillars of beauty

>>Our visit to the third company on our itinerary takes us to the idyllic Swiss village of Rütli in the Rhine Valley between St. Gallen and Chur, not far from the Austrian border. "WKW-KTR" is the name on the door. Works manager Michael Matiz explains that WKW stands for the parent company Walter Klein GmbH & Co.KG, Wuppertal, and KTR for "Kunststofftechnik Rütli". WKW-KTR (www.wkwktr.ch) was established in Rütli as a branch factory of the Wuppertal aluminium processor WKW in 1981. As WKW had been specializing in the manufacture of parts for car bodies for the past 60 years, it was only logical that the Rütli facility should build on WKW's "trim experience", but then work entirely in plastics as an innovative alternative.

All kinds of automotive trim components – from side impact strip, decorative profiles and rain channels for windscreens through to wheel arch trim and ABC pillar mouldings – are this Swiss company's business. Although the focus was originally on impact protection, these components today not only constitute an important part of a vehicle's styling but also perform a variety of functions. The simple extruded profile has now given way to the more complex, three-dimensional moulded part which must satisfy a diversity of demands for high precision and functional perfection.

WKW-KTR began with the development of plastic pillar trim for the BMW Mini six years ago. Originally moulded in ABS and painted, the pillar trim underwent constant further development. This led to the very first unpainted high-gloss black A-pillar trim and – in addition – the "Automotive Design Award" of the Society of Plastics Engineers.

The next step – another "first" – was the ingenious development of this design trim into a functional trim for the B-pillar of the new 1-Series BMW. Here the design trim and the window guide were combined into one single

functional part, the mass production of which is already being pioneered by WKW. A further product highlight is WKW's newly developed rain channel moulding for the Mercedes R-Class, a luxury SUV. It is a two-component injection moulded part of complex design which could not possibly have been realized in any material other than plastic.

A closer look at the complex requirements these parts have to satisfy tells us why there are only a few firms in this special field – and WKW is not only one of them but also up in the lead. One of the company's key factors of success is that it does not just develop plastic parts but also offers an all-in service, beginning with moulded part design, continuing through mould concepts, mould filling simulation, 3D measurement and rounding off with proposals for suitable packaging. No matter whether internal gas pressure or multicompnent injection moulding, fastening methods using clips or adhesive tape or surface finishing techniques such as painting or lacquering are required, WKW can offer a complete package from start to finish.

In the course of our conversation, Michael Matiz confirms that much of the credit for WKW's steady development as a high-tech partner to the automotive industry must go to the Engel injection moulding machines. The partnership with Engel began in 1996 with the purchase of an ES 1350H/500L/350 HL-2F. Meanwhile, WKW has a great many Engel injection moulding machines in service, with clamping forces ranging from 500 to 1,700 kN. The latest addition is an ENGEL DUO 7050/1700, on which such parts as door sills, wheel arch extensions and side impact strips are produced with four-cavity moulds. – And this ENGEL DUO 7050/1700 is the largest Engel injection moulding machine in Switzerland to date.

In view of the success so far, it is safe to say that WKW will be using Engel machines for a long time to come. Four further ENGEL DUO 650 and 1000 machines – three of them each equipped with two injection units – are about to be delivered. <<

22nd October 2005, "Fakuma" in opening its doors to the world of for us to pay a visit to three of where three countries meet on the

ments and innovations eventually made Pfeiffer the leading manufacturer of spray and dispensing systems for the pharmaceutical industry, and also for the cosmetics industry, Pfeiffer's second mainstay, which accounts for approximately 30% of company sales.

Pfeiffer's range of drug delivery systems – this being the focal point of our interest – is extremely wide and includes droplet dispensers, atomizers for topical, nasal and oral administration and special dispensers for fast-acting heart or migraine medications which are absorbed via the mucus membranes. And as drugs have to be dispensed as accurately as possible, these systems are available in a

... discharge the moulded parts directly into fully automated assembly cells (photo on right). Not least the unrestricted access for parts removal afforded by Engel's tiebarless technology is of enormous advantage to Pfeiffer in this complex of interlinked machines.



WKW-KTR: When it comes to producing individually designed plastic parts economically, many creative ideas are called for, ideas which in turn call for tiebarless clamping units for the unimpeded installation of long, narrow moulds or for large-capacity machines with ample space for multicavity moulds. The machines of the ENGEL VICTORY and ENGEL DUO series ideally meet these requirements.

ENGEL ELAST 400 V Compact The new measure of operator comfort



Measuring only 775 mm from the floor to the top edge of the heating platen, the clamping system of the new ENGEL ELAST 400 V Compact is the "ideal size" for manual operations.

>> On account of the enormous headroom requirement for the hydraulic clamping systems of vertical-type elastomer injection moulding machines, machine operators have always had the problem of being too small for the manual job of insert placing and parts removal, necessitating the installation of suitably high platforms or suitably deep pits in the floor. With the new ENGEL ELAST 400 V Compact (4,000 kN clamping force), such problems are now a thing of the past. No matter where it is installed, the machine affords the operator a comfortable working height of under one metre. And this ready accessibility facilitates mould change, too.

New hydromechanical clamping system

This "new measure" of operator comfort has been achieved with a completely modified clamping system. Opening and closing movements and the upward and downward movements of the bottom, moving platen are still performed by small-bore, high-speed hydraulic cylinders in order to ensure the shortest possible cycle times. What is new is the clamping force build-up system comprising a laterally extensible and retractable plunger and a pressure pad which is supported by the plunger. The plunger also



Laterally retractable and extensible: the plunger of the hydromechanical clamping system of the ENGEL ELAST 400 V Compact. During mould changes, the plunger quickly and fully automatically sets the machine to the new mould height. The short stroke of the pressure pad, which is supported by the plunger, ensures rapid clamping force application.

serves as a fully automatic mould height adjuster. The hydraulic pressure pad ensures uniform pressure distribution across the platen. This in turn ensures flash-free production – the aim of every rubber injection moulder.

The improvements described above are not the only ones made possible by this modified clamping system. Besides the drastically reduced operating height, the overall height of the machine is a good 500 mm lower, the rubber strip feed is lower (only 1,880 mm high) and the overall space requirement of the machine has been reduced. The new compact ENGEL ELAST 400 V Compact is ideal for manual loading in cases where particularly large and heavy inserts are being processed. Ample space between the platens makes the clamping unit even more accessible. And it goes without saying that all existing equipment modules, such as sliding tables and sliding plates, are also available with this new machine.

>> The new ENGEL ELAST 400 V Compact will be available this coming autumn. To complete the series, it will be followed by the models 600 V (6,000 kN) and 800 V (8,000 kN clamping force).<<



ENGEL VICTORY Electric Lim Now standard

First demonstrated on a partner's stand at "K 2004" in Düsseldorf, the ENGEL VICTORY Electric Lim is now available as a standard machine.

>> The ENGEL VICTORY Electric Lim is ideal for the processing of liquid silicone rubber (LSR), especially in such cases where the required quality of part can be achieved only through the highest precision and reproducibility during the metering and injection operations. To this end, this "hybrid machine" unites the perfected technology of the tiebarless ENGEL VICTORY series with the high precision of the injection units of the all-electric E-MOTION series, these having been adapted for liquid injection moulding. Engel's LIM technology reliably covers a broad spectrum of standard types of LSR, including the highly reactive and highly filled LSR types which are currently flooding the market.

Equipped with energy-saving, low-noise variable delivery pumps, the hydraulic drive system of the clamping unit permits actuation of ejectors and cores during the opening and closing of the mould, thus considerably reducing the cycle time. The cycle time is further reduced by the all-electric injection unit: independently operating three-phase servo motors for screw rotation (melt feed) and for the axial movement of the screw

(melt injection) afford every possible scope for parallel movement. Exact stroke measurement ensures high positioning precision and reproducibility of all machine movements.

This feature, combined with the exact measurement and feedback control of the injection and back pressures using new types of measuring diaphragms, makes for extremely high process stability and, by the same token, high machine efficiency.

>> Based on the modular ENGEL VICTORY series, the ENGEL VICTORY Electric Lim is available as standard within the clamping force range up to 3,000 kN.<<



The all-electric LIM injection unit is available both as a screw unit and as a plunger unit.

injection

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Successful acceptance tests on the 60th Engel machine to be purchased by Dyka (from left to right): Alexander Leitner (Engel Sales Coordinator for the Netherlands), Gerard Oosterhof (Production Manager at Dyka in Steenwijk), Tom Madereel (General Manager Engel Netherlands), Jacco Pleijsier (Head of Production Engineering at Dyka) and Hans Kuilder (Assistant to Production Manager).

It's already Dyka's Engel No. 60

>> In June 2005, Dyka B.V., Steenwijk/Netherlands, carried out acceptance tests at Engel Schwertberg on its 60th Engel machine, an ENGEL VICTORY 2550/260 Tech with tiebarless clamping unit. This machine belongs to the most recent delivery batch totalling six tiebarless injection moulding machines to be ordered by this Dutch pipe fittings specialist. For many years now, Dyka has been giving preference to Engel's tiebarless technology when ordering new machines for the production of pipe fittings. Dyka has

come to appreciate not only the precision and sturdiness of this machine type but also the freedom of access to the clamping unit for mould changing operations. For its pipe fitting moulds, which are generally large and unwieldy, Dyka now requires half the set-up time previously required for machines equipped with tiebar clamping units.

With as many as 850 fitting moulds in regular use and an average of 25 mould changes per day, set-up times at Dyka are an important factor when calculating available machine capacity. Not least for this reason does Dyka now insist on tiebarless machines of the ENGEL VICTORY series for every application requiring a clamping force of between 250 and 6,000 kN. <<



... MuCell decompression injection moulding?

“MuCell decompression injection moulding” is the term used to describe the manufacture of physically foamed parts (MuCell process) when foaming is initiated not by the injection process but by enlargement (decompression) of the mould cavity after injection and cooling of the melt.



Foamed PP (polypropylene) sheet produced by the MuCell decompression injection moulding process: the initially moulded part (having the appearance of a solid, conventionally moulded part) had a wall thickness of 3 mm. The final thickness of the sheet measures 10 mm.

>> The basic MuCell principle has already been explained in a previous issue of “injection”: the blowing agent (nitrogen or carbon dioxide) is injected as a supercritical fluid directly into the plasticizing cylinder where it uniformly dissolves in the melt. After injection into the mould cavity (partial filling), the gas expands and forms a microcellular foam which completely fills the cavity. The result is a dimensionally stable part which is largely free from internal stresses.

However, if the entire volume of the cavity is filled and the melt is then cooled under pressure, the blowing agent cannot expand and will remain dissolved. If this “solid” part is then subsequently heated (to approximately glass transition temperature), it will swell to several times its initial thickness (“popcorn effect”), even if considerable time has elapsed between moulding and heating.

With the so-called decompression injection moulding process, this stored energy is exploited in the injection moulding machine under controlled conditions. In other words, the melt-filled cavity is subsequently enlarged to the desired final thickness of the part (see diagram below), for example by reducing or even removing the clamping pressure. Even large-area parts produced by this process display very high flexural rigidity and a comparatively good surface finish, although the highest standards of finish cannot be achieved. Whilst the decompression injection moulding process can also be performed with chemical blowing agents, the MuCell

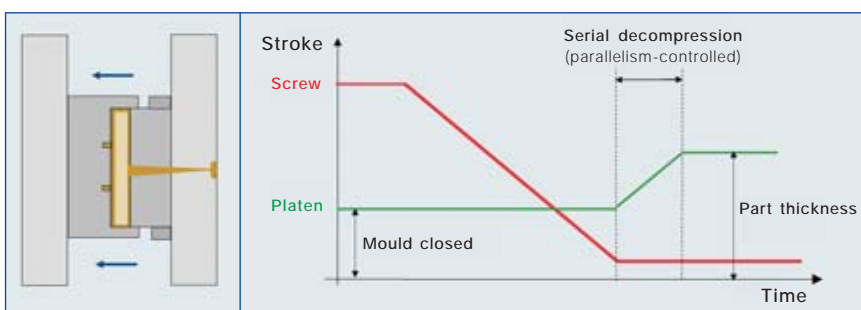
process generates considerably higher expansion pressure.

>> MuCell decompression injection moulding is particularly suitable for the manufacture of packagings, especially insulated packagings. Potential applications even include door modules or instrument panel supports for the automotive industry, where dimensional stability and flexural rigidity are just as important as lightness of weight.

>> The wall thicknesses achievable with this process may be three to four times the initial thickness – foam parts in PE-HD and PP have already been produced with final wall thicknesses of between 10 and 12 mm.

ENGEL DUO – the ideal basic machine

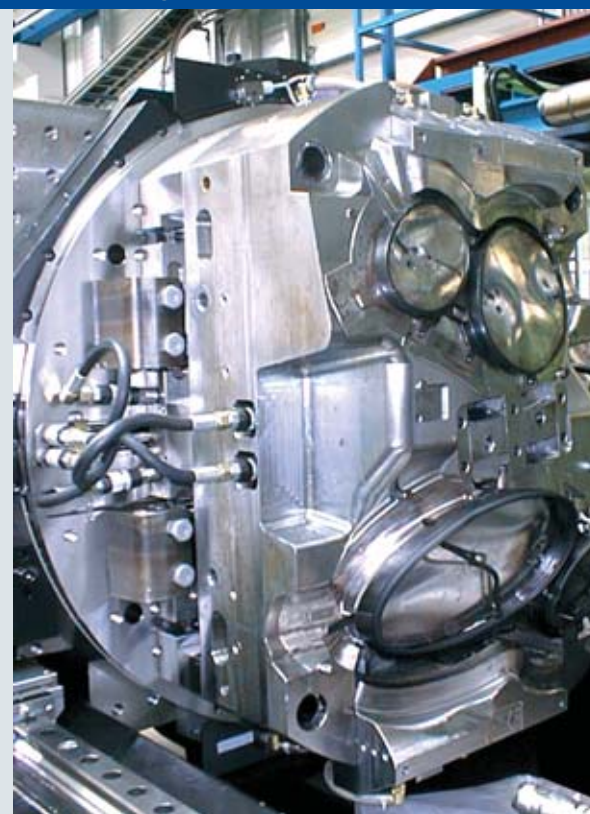
Engel's large capacity machines (ENGEL DUO) are particularly suitable for the MuCell decompression injection moulding process, especially when parts – even large-area parts – must have a very uniform wall thickness distribution. The control system-integrated platen parallelism feedback control, which has been specially developed for the DUO series, prevents misalignment of the platens through possible process irregularities (e.g. uneven foaming). Deviations from parallelism are detected during operation with a resolution of 5/100 mm and corrected via the individual hydraulic systems of the four tiebars.<<



Suitable moulds for the MuCell decompression injection moulding process, for example, are either positive moulds (left diagram) or frame moulds. Diagram on right: Once the cavity is filled, the cavity enlarging stroke should be parallelism-controlled if possible.

Engel tiebarless technology Freedom + Precision

Engel has been building tiebarless injection moulding machines ever since they were launched on the market in 1989 and today offers them under the brand name of ENGEL VICTORY in clamping forces ranging from 250 to 6,000 kN. Over 23,000 tiebarless machines are meanwhile in service worldwide. Why do so many plastics processors prefer this type of machine?



An ENGEL VICTORY with a clamping force of only 350 tonnes and an enormous rotary table (110 cm diameter) – plenty of useful platen area for the huge mould for the economical mass production of two-component car headlamp covers.

>> Developed by Engel, the tiebarless clamping system of an injection moulding machine affords the user both technological and economic benefits. Unrestricted access for automation equipment, utilization of the full platen area, extreme freedom of mould design and faster set-up times thanks to easier mould change are the obvious advantages at first glance, and the user of a tiebarless machine need not make any concessions as regards precision either.

Tiebarlessness and precision are not a contradiction of terms

In order to demonstrate the platen parallelism of the tiebarless clamping unit and hence also the parallelism of the mould during the injection moulding cycle, an ENGEL VICTORY (2,000 kN clamping force) was equipped with three high-resolution length measuring sensors (see panel). Sensor 1, positioned on the side of the platen at the top, measured the top horizontal movement of the platen, sensor 2 measured the bottom horizontal movement and sensor 3 measured the vertical movement of the mould. The stroke/time curves were recorded from the moment immediately preceding the closing of the two halves of the mould until clamping force build-up, during the holding pressure time of approx. 3 seconds and during the opening of the mould. No mould centring device was used during the trials.

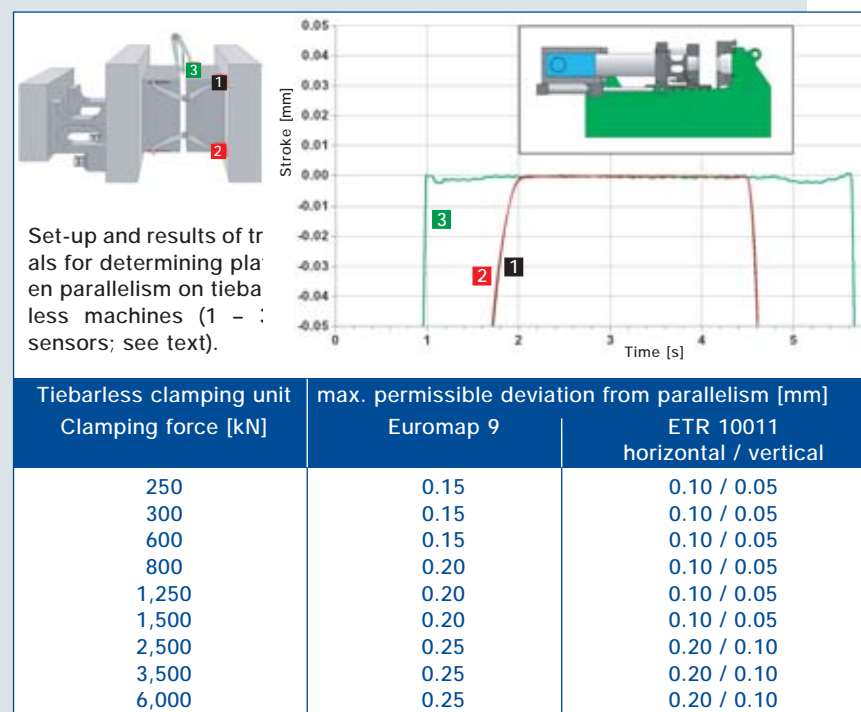
The results (strongly magnified resolution of measurements for clamping force build-up and release) document the virtually exact parallel closing of the two halves of the mould (congruence of the black and red curves). This is further confirmed by the recorded measurements for the “vertical movement” of the moving mould half (green curve): the top edge of the mould moves constantly at the reference height (reference value “zero”) throughout the cycle. When sensor 3 makes contact with the front face of the mould half, the mould is still open by a distance of barely 3 mm. The minuscule fluctuations directly after contact result

from the sensor's reaction to surface roughness until the mould is completely closed. The same fluctuations occur when the mould opens. The results obtained in this trial were also corroborated by trials conducted with other sizes of clamping unit.

The exact parallel movement of the tiebarless clamping system is not least important for the service life of the mould. Long-term durability is

More than just standard parallelism

A useful guide to the testing of platen parallelism is the EUROMAP Technical Recommendation 9 (Injection moulding machines – Testing the parallelism of the platens during closing – 1998.09). Engel, however, applies its own standard,



further ensured by the high-precision linear antifriction bearings mounted on the solid tiebarless frame which guides the moving platen. This sturdy support will move extremely heavy moulds with a minimum of friction and without any risk of sagging during the opening and closing operation.



The adjustable, maintenance-free FlexLink not only ensures parallelism of the moving platen during the injection moulding cycle but also transmits the clamping force to the mould.

namely ETR 10011 (ETR = Engel Technical Rule). Contrary to Euro-map, this standard specifies closer tolerances for the maximum permissible deviation from platen parallelism in the case of tiebarless clamping units (see table).

In order to achieve this extreme precision, the horizontal parallelism of the moving platen in relation to the stationary platen is set at the factory by exact adjustment of the guide rails on the frame. Vertical platen parallelism is accurately adjusted and permanently set to within a 500th of a millimetre by means of the setting facility integrated in the FlexLink.

>> Further details in “Kunststoffe plast europe” 7/2005, and at Engel's website www.engel.info under the column “Technical publications”: Tiebarless – What Are the Benefits? <<

Engel strengthens its network in the new EU countries

>> In the 1950s – despite all the political differences – Engel already had a dense network of representatives and agencies in its neighbouring countries of Eastern Europe. Following the collapse of communism in 1989, Engel has meanwhile been able to set up its own facilities. Engel now has its own subsidiaries in the Czech Republic (since 1990), Hungary (1993) and Poland (2002). Engel Finland completed the “East-

ern network” in 2002 and also handles the Baltic markets of Latvia and Estonia, while Lithuania is the responsibility of Engel Poland.

The new economic dynamism prevailing in Europe since these countries joined the EU in 2004 has prompted a further strengthening of Engel’s network. On the agenda are many improvements to customer service, such as local training centres, strengthened technical service

facilities and spacious demonstration rooms. Engel Czech Republic will commence operations in its new building at the end of 2005 with a work force of 33 (21 service personnel). Engel Poland will move into its new building at the end of 2006 with its work force of 19 (11 service personnel). Engel Hungary (13 employees) has been in its new building since November 2002. Further expansion is planned. <<



Left: Engel Czech Republic will move into its new building in Prague at the end of 2005. Centre: The planned building of Engel Poland in Warsaw will be completed by the end of 2006. Right: Engel Hungary has been in its new building in Budapest since November 2002.

Engel celebrates 100th machine sold to Seeber-Röchling Automotive

>> The worldwide operating automotive supplier Seeber-Röchling Automotive and Engel had two reasons for celebration in Schwertberg on 8th September 2005: the 100th Engel machine to be sold to Seeber-Röchling Automotive and the fact that large-capacity ENGEL DUO machines account for exactly half of this number – and all within the short period of 13 years. These Engel machines together produce around 50 million moulded parts for the automobile industry every year. They run to more than 90% of their capacity (this is far higher than the efficiency normally achieved in this branch of industry) and the scrap rate is less than 150 ppm (in other words: less than 150 defective parts for every million parts produced) – indeed a considerable achievement on the part of both Engel and its customer Seeber Röchling Automotive, Mannheim, with its wide network of subsidiaries.

But there is more than “just” a supplier/customer relationship behind these figures. One of the foundation stones of today’s success was laid when Seeber took the strategic decision to purchase its injection moulding machines from just one supplier who could also meet its need for a dependable and capable technology partner. “Looking back,” said Ulrich Mauss, Member of the Managing Board of Seeber AG & Co. KG, “that was the key to fast production start-ups and continu-

ously high production efficiency. If we had not deliberately limited our scope of technical variants, we would not have been able to train our machine operators and maintenance personnel so quickly and, more importantly, get production started up at our overseas production sites with the minimum possible delay. Naturally, we had to place our trust entirely in our machine suppliers. Our choice in favour of Engel was made not least on account of Engel’s longterm-oriented business policy which harmonized well with that of Röchling, which, like Engel,

is a family company.” – “Engel, too, has derived lasting benefits from this longterm partnership,” said Dr. Peter Neumann. “Through its ambitious requirements in terms of operating stability and production efficiency, Seeber-Röchling Automotive has initiated a great many further developments at Engel, and these are meanwhile standard features of our machines.” And there is something else, too, which Seeber and Engel have in common: during their partnership they have both developed to become globally manufacturing companies.<<



The 100th Engel machine being officially handed over to Seeber-Röchling Automotive (from left to right): Dr. Peter Neumann, Chairman of Engel Holding, Dipl.-Ing. Ulrich Mauss, Managing Board of Seeber AG & Co. KG, and Franz Käferböck, Head of Engel Plant Projects and Key Account Manager for Seeber-Röchling Automotive.

Engel training concept could be a prize winner

>> With its “Flight Simulator for Injection Moulding Machines”, Engel Germany in Hagen is still in the running for the “Initiative Prize for Training and Further Education”, which the Otto Wolff Foundation and the German Chamber of Industry and Trade has been awarding in collaboration with the business magazine “Wirtschaftswoche” since 1993. More than 60 projects were entered in 2005 and seven have now

reached the final round. Each of these finalists can still win one of the three main prizes. The winners will be announced at an award ceremony in Berlin on 7th November.

The award honours projects that are “exemplary in furthering and strengthening initiative in vocational training in trade and industry” and “sharpen the public’s awareness of the responsible role of employers in the training and qualification of

skilled and managerial employees”. – The “machine simulator” (ENGEL e-TRAINER) is one of the modules of Engel’s practice-oriented training programme. The trainee has the complete control panel in front of him on the PC screen, together with a visualization of the machine movements resulting from his inputted commands (this was already the subject of a previous article, see “injection” No. 10, page 7). <<



“Engel Elast Days” were an enormous success

>> Taking place in Linz and at the Engel parent factory in Schwertberg (on 20th and 21st September for English-speaking participants and on 22nd and 23rd September for German-speaking participants), the “Engel Elast/LIM Symposium” was an enormous success. As many as 200 processors from 14 countries followed with great interest the presentations of the latest innovations in Engel’s range of elastomer and LSR injection moulding machines. The highlights of the symposium were the significantly improved operator comfort of the vertical machines and the modular configurability of the horizontal ENGEL ELAST and LIM machines.

Four machines, each demonstrating a concrete example of application, complemented the series of lectures:

>> ENGEL ELAST 2700/400 V Compact – the new series of ergonomically improved vertical machines

The ergonomic advantages of the machine system were exemplified by a demonstration of the production of a sheet metal engine block gasket with a moulded-on circumferential elastomer seal in EPDM (turn to page 6 of this issue of “injection” for technical details of the machine).

>> ENGEL ELAST 280/120 Victory – the tiebarless horizontal machine with the service-proven FIFO injection unit

The production cell with the horizontal tiebarless clamping unit demonstrated a standard application for automated production. Equipped in

this particular case with a 48-cavity mould, the machine produced V-ring seals in EPDM in a cycle time of 70 seconds.

>> ENGEL VICTORY 310/110 Electric Lim – the tiebarless hybrid machine with the high-precision, all-electric LSR injection unit

This requirement-specific “hybrid system” consists of a tiebarless Victory mass-production machine equipped with a high-precision E-Motion injection unit. The superior positioning precision of the all-electric injection unit considerably improves metering accuracy when processing low-viscosity materials, such as LSR. Improved machine efficiency and reduced energy consumption are the result. The machine at the symposium demonstrated the production of cable grommets in an 8-cavity mould.

>> ENGEL VICTORY 200H/80W/80 Combi – multi-component injection moulding with process-integrated assembly

Combimelt injection moulding with LSR as the second component was the theme of the fourth application demonstration – combined in this particular case with a downstream robotized assembly process. The moulded part was a strainer and stream shaper insert for sanitary tapware. The technical highlight of the machine was a three-station rotary table, the eccentric arrangement of which permitted the installation of a third, freely accessible station between the two injection stations. This third station served as the assembly station. <<

Entries invited for the “HL Award”

>> Since 1989, Engel customers have been enjoying the benefits of tiebarless injection moulding machines, of which more than 23,000 are meanwhile in use worldwide. These benefits range from unrestricted access to the clamping unit – for setting up complex, awkwardly sized moulds without any need for partial dismantling – to the obstacle-free integration of automation equipment, thus affording the user a wide scope for innovative application.

The “Engel HL Award” (HL is the abbreviation of the German word for “tiebarless”) is regularly awarded for particularly innovative applications. Tradi-

tionally, the award ceremony takes place during one of the big events of the year. The event chosen for next year is the “Engel Symposium 2006”, which will be held in conjunction with an in-house exhibition at Engel’s St. Valentin factory on 17th and 18th May 2006. Entry invitations will be sent out before the end of December – and the award will be presented during the evening function of the symposium. <<

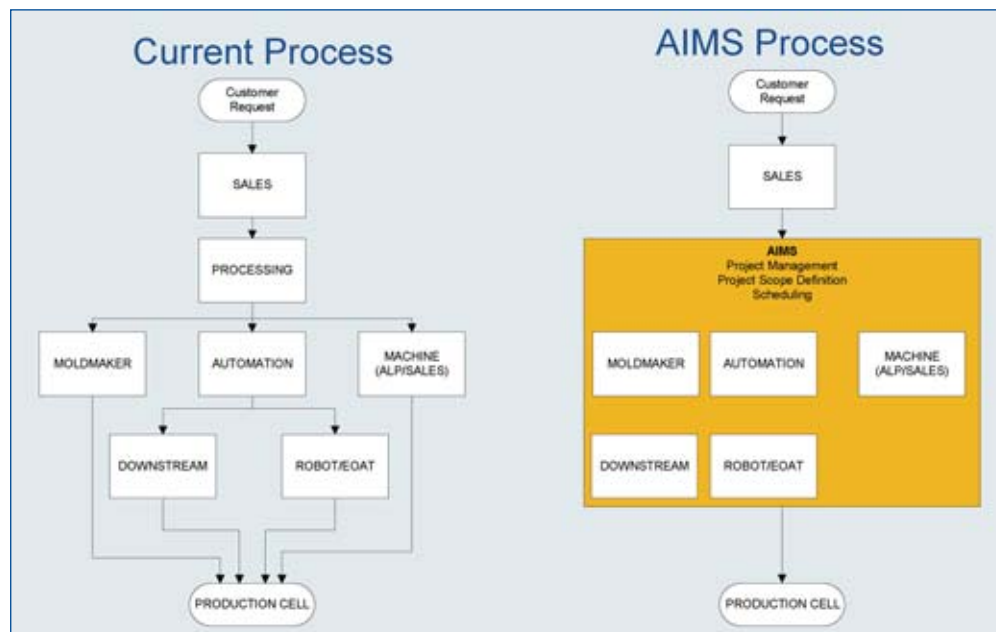


Engel Canada AIMS: Advanced Injection Molding Systems

>> To remain successful you must identify and adapt to changes in your market. In the North American plastics industry, the trend continues to automation. Molders have realized that in order to compete in the global economy they must increase manufacturing efficiency.

At Engel, we continue to develop new ways to better serve our customers. To address the growing trend to fully automated production cells, we have created the AIMS Group.

The AIMS (Advanced Injection Molding Systems) Group will provide a single point of contact for those customers that are purchasing automated cells and complex systems. This group is responsible for the design and development of Engel production solutions, as well as managing the production process of both internal and external suppliers. <<



>> Scherer & Trier was founded in 1967 by Andreas Scherer, George Scherer and Lothar Trier in Michelau, Germany. The tiny company's core business was based on extrusion technology with products in the local basket and small furniture industries. In 1971 the company launched production of profiles for the automotive industry and, finding immense success in this sector, Scherer & Trier began to grow rapidly, opening a number of plants throughout the 1970s and 1980s. In 1984, the company expanded its range of products by

daily and develops scores of revolutionary problem solutions every year.

Scherer & Trier USA

In the spring of 2005, Scherer & Trier opened its newest manufacturing plant in Saline, Michigan. This plant plays an important role in the company's business plan of expanding into the North American market: once in full operation, the facility will allow Scherer & Trier to bring

>> The mounting of one injection unit on each platen permits a simple design of the central, moving part of the mold, waiving the need for a complicated runner system – especially suitable for large area parts with integrally molded seals or gaskets such as car window panes.

- >> The design permits optimum utilization of the available space between the tiebars.
- >> The central part of the mold can revolve in steps of 90°, which provides easy access for insert placing and part removal robots.
- >> The design can also be used without the rotary unit, using a middle plate or carrier, to mount two single molds – back to back – allowing production of two independent parts per cycle.

The flexibility provided by this machine design provides Scherer & Trier the ability to adjust to the demands of their customers while remaining efficient and competitive.

Up and running ... and already growing

The two freshly-built production lines are being launched to provide a new Dodge vehicle with a complete roof system. The molds have all been "broken-in", with the first parts delivered to the customer in June, and series production scheduled to start in the fall. – Only months after the plant's opening, Scherer & Trier already have plans underway for expanding the new facility – proving their commitment to manufacture high quality, reliable products for the North American market. <<

Growing with Scherer & Trier

adding injection molding technology, and has successfully positioned themselves in this market by continually developing new applications. In the last decade, Scherer & Trier has expanded its production to an international scope, opening manufacturing plants in Mexico, Sweden and most recently the United States.

Today, as a full-service supplier of system solutions for the plastics industry, Scherer & Trier prides itself on offering its customers reliable, high-quality products using the most cutting-edge technology available. From its early Michelau roots, Scherer & Trier has grown tremendously and now employees more than 2000 people in its various research, development and production facilities. The company produces half a million plastic parts

their world-class production capabilities to Tier 1 and Tier 2 automotive companies in the US and Canada. The plant will be ready for full production by the fall of 2005.

To equip their plant with the most state-of-the-art technology and acquire a competitive edge, Scherer & Trier turned to Engel, where they found a partner that shared their goal of always finding the best solution within the bounds of possibility.

The solution was the ENGEL DUO 1650 US Combimelt machine in the latest 'M' configuration – 1650 US tons of clamping force combined with a rotary module, mounted on a sliding carriage inside the clamping unit, and an injection unit mounted on each platen. This machine design provides Scherer & Trier with several major advantages:

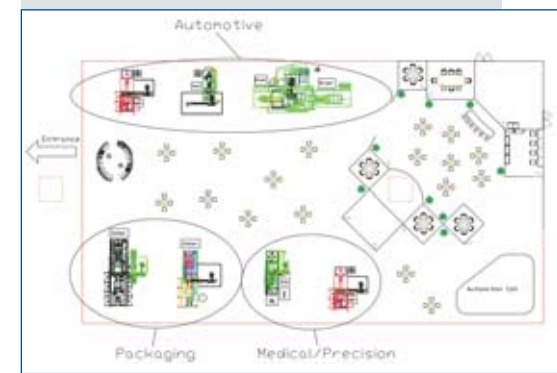


It's Showtime!

>> Engel North America is already well into planning its exhibit for next year's NPE 2006 show. As the largest North American trade event dedicated to the plastics industry, NPE 2006 will showcase some 2,000 exhibitors displaying new materials, processing machinery, equipment and technologies that can turn your product ingenuity into competitive strength.

In a display space of over 14,000 square feet, Engel will exhibit machinery, automation and process technologies focusing on the three main North American markets: automotive, packaging and medical/high precision. Highlights include packaging solutions such as the new ENGEL SPEED machine line, innovations for the automotive industry include a DUO two-platen machine with Glazemelt technology, and new technology for the medical market with our latest in all-electric machine technology – the E-MOTION Combimelt machine.

- >> All exhibits will showcase the latest in Engel and industry automation solutions.
- >> A variety of processing technologies will be exhibited, with applications including: LSR, Combimelt; X-Melt (expansion molding), insert molding, Foilmelt (in-mold decorating), and part validation/quality control.
- >> Engel will also use the NPE show to introduce the new CC200 machine controller to the North American market.
- >> In the booth's Technology-Training Corner, Engel's latest and most advanced training material, the CC200 e-trainer – "flight simulator" style training tool will be available for test-flight. <<



The two machines installed in the Scherer & Trier plant are the first Combimelt "M" machines delivered in North America.



Vision2

From Vision to Reality

>> For more than 30 years, Vision2 has designed and manufactured a wide variety of innovative protective eyewear products for sports, safety, industrial and military applications. A leader in optical injection molding, they offer their customers a full range of services from quality injection molding to unique coating technologies. Over the years, Vision2 has brought unparalleled innovation and technologies to the consumer, military, telecommunications, aeronautics and medical industries.

With over three decades of injection molding experience in optical polycarbonates and materials, Vision2 has the technology to make any customer's vision possible. Their in-depth, world-class injection molding machines provide a wide range of capacities, and their state-of-the-art clean room facilities assure the high-

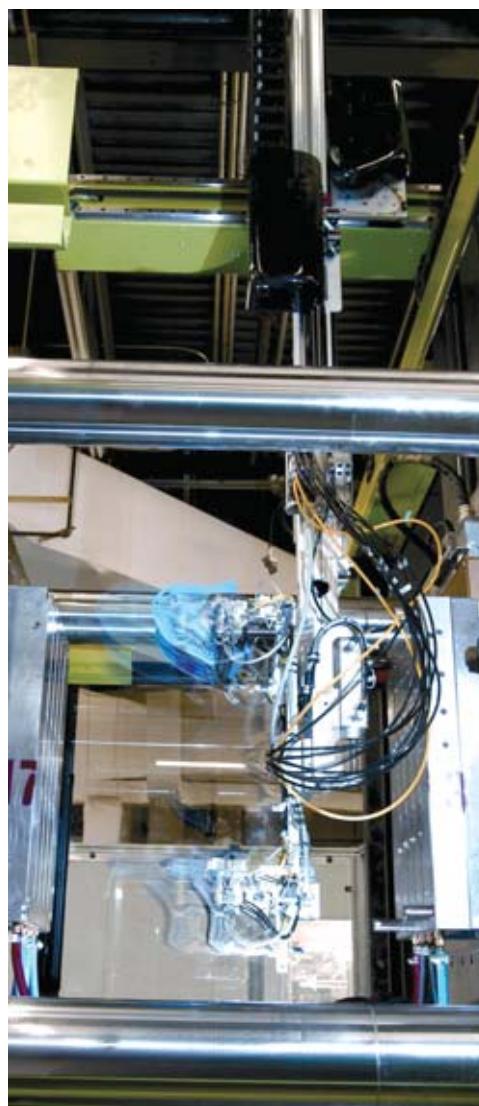
est grade of optical purity and particle free coating.

Vision2's skilled project team brings vast experience and multi-disciplined skills to every project they undertake. From concept to design to testing to construction to finished product, their team has the capability to take every product from literally vision to reality.

Time to Automate

An Engel customer since 1992, Vision2 knew where to turn when looking for ways to become more competitive in their market. As a supplier of both injection molding machinery and automation, Engel could provide completely automated molding cells to enable

From vision to reality, Vision2's team provide everything from concept to finished product using the latest in molding and optical coating technologies.



robot removes the lenses from the four cavity mold using a specially-designed end of arm tooling (EOAT). There is a specifically-designed EOAT to correspond with each of the six different molds. The robot then moves the parts past a deionizer station which reduces static on the lenses. Next it positions the lenses at the cutter station where the runner is removed. The lenses are then handed off to the part flip station which rotates down 90° and transfers the lenses to the orientation nest. Once re-oriented, the robot transfers the lenses to the defogger station where each lens is coated with an anti-fog solution. Finished lenses are removed and deposited onto the outfeed conveyor system.

Cell #2 – Goggles: The ERC 44 E-series robot retrieves the lens inserts from the parts trays which are located in two shuttle table stations. The inserts are transferred into a 100 ton tiebarless injection molding machine for overmolding. Once the machine has completed its cycle, the robot positions the de-mold EOAT to retrieve the overmolded parts and puts in the next set of inserts. The finished parts are transferred to the deposit position on the outfeed conveyor system.

New Product Requires New Technology

At the same time as automating their water goggle production, Vision2 also added Engel Combimelt technology to their plant floor to launch production of a new product – a multi-component paintball facemask. This molding cell consists of an ENGEL TOGGLE 450 US Combi press with an ENGEL ERC 53/1-E robot which is equipped with a double end of arm tooling (EOAT)

The mask is molded in a 1+1 cavity mold. Once the first cavity is molded (nylon) the robot picks the part and transfers it to the second position for overmolding (TPE). The robot removes the finished part, takes it to a degating station, and once degated, places it on a conveyor.

This Combimelt technology solution provided Vision2 with improved process efficiency and lower scrap production – both cost saving advantages.

Vision2 maintains a partnership with the company they count on to bring them the latest innovations in injection molding technology – Engel – allowing them to maintain their leadership in optical injection molding, and continue growing their business in the North American marketplace.

>> www.vision2.ca <<

Recent Additions to Engel Canada

>> Engel Canada Inc. is pleased to announce a recent addition to their management team:

Graham Brown has joined Engel in the position of Vice President Operations, responsible for Engineering, Production, Materials and Order Management. He comes to Engel with over 20 years of experience at Siemens and Westinghouse, where he held various managerial positions in marketing, manufacturing and engineering.

Graham is a mechanical engineering graduate and a Professional Engineer. He led many diverse business and manufacturing improvement initiatives in his career using processes like Continuous Improvement and Six Sigma. In these projects he has worked closely with cross functional teams of people to increase business competitiveness.

Graham's diverse background will enable him to meet the challenges of manufacturing injection molding machinery.

Ron Tanguay joins the sales team of Engel Canada in the position of Sales Director, with a broad background in sales management both in North America and abroad. Ron has had the opportunity to work directly with major automotive suppliers such as Lear, Magna, C & A, Johnson Controls and Denso to name a few, as well as extensive experience in working closely with Toyota North America.

Prior to his career in the plastics industry, Ron was involved in project management of large power and steam generation products in countries such as Brazil, Israel, South Africa, Australia and Thailand.

Ron looks forward to the challenges facing Engel North America in a highly competitive and changing market place. He believes that the superior products, excellent customer service and extensive North American infrastructure will allow Engel to meet these challenges. <<



Graham Brown



Ron Tanguay

Swim goggle lenses: A focus on two cells

Vision2 maintains two separate manufacturing cells to produce various styles of swim goggle lenses for the consumer products industry. The first cell, capable of molding six different lens styles, manufactures the lenses, while the second cell, also with the capability of molding six different styles, overmolds the lenses to produce the finished goggle.

Cell #1 – Lenses: The lens molding cell consists of a 100 ton tiebarless machine equipped with an Engel ERC 33/1-C robot. Upon completion of the molding cycle, the

>> Initially W&S (www.wsplastics.com.au) was a general custom molding shop which under Andrew Wiseman's leadership developed over the years into a Australian high tech molding shop dedicated to technical-medical components. In the year 2003 W&S bought their first Korean made Engel Molding machine and has since acquired eight more Korean Engel's covering a clamp force range from 45 to 220 tons.

Andrew Wiseman (BE, BSc, B com) is proud to state that his company's growth pattern now exceeds 20 % annually. Andrew states that his vision for the future backed up by a highly skilled staff and the acquisition of first class machinery made the W&S success story possible.

>> "What goes out must never come back" is the philosophy of this eminently successful company.

Robert Dornenburg, the Engel anchor man in Australia reports that over the last three years almost 50 Korean made Engel machines have been sold in the local Australian market. It has become evident, so Robert Dornenburg reports, that Engel's global approach to manufacturing as had resounding success in Australia.

Customers are fully aware that Korean build Engel machines are identical to Austrian build machines and no compromise in technology or commitment to quality has been made when it comes to machines produced by Engel Korea. Our market understands that Engel Korea is a fully Engel owned and managed enterprise and customers have come to the conclusion that it is irrelevant where the



W&S Plastics in Sydney/Australia is a second generation company founded in 1977 by Lindsay Wiseman and Trevor Syme, presently managed by Andrew Wiseman (photo on left).



Australia: W&S Plastics Successful – already in the second generation

"green machine" was made as long as it is an Engel.

Shorter delivery and ultra fast response from Engel Korea has been instrumental in the growth of Engel's Customer base over the last three years.

It is gratifying to know that Korean build Engel machines are in action in high demand industries like the Australian medical, electronic, packaging and automotive sectors.

Our customers are delighted and are anxiously awaiting for Engel Korea to expand the machine range to 600 tons. <<



Singapore: Avaplas A strong confidence in Engel



>> Established in 1993, Avaplas Ltd is a specialist manufacturer of high precision engineering plastics and related manufacturing services (www.avaplas.com.sg). Combining the latest in molding technology and precision injection molding, Avaplas provides manufacturing solutions to its global customers' manufacturing requirements in the printing and imaging, electronics, healthcare, telecommunication and consumer industries.

When it first started, it has several IMM's, one of them an Engel ES125, but now it owns more than 20 Engel machines, with its network of manufacturing facilities spanning across Singapore, Malaysia, Thailand and

China. In the year 2001, CEO Boone Quek spearheaded the Company's effort in embracing a new molding technology- MuCell Molding technology. Working closely with their customer, Avaplas acquired their first MuCell Machine ES300 from Engel, the first MuCell System in Asia, and successfully became Asia pioneer in the use of MuCell technology for commercial production.

Within less than two years, Avaplas purchased a total of five Engel MuCell Systems, ranging from 125 up to 500 tons clamping force. The rapid expansion in this new process technology has in turn anchored Avaplas to become the leader in the use of MuCell technology in Asia. Today, Avaplas has MuCell Molding capabilities in all its manufacturing facilities with MuCell machines ranging from 125 ton up to 500 tons clamping force.

Avaplas is ranked as a top tier molder by its customers based on its ability to produce high precision mechanical parts requiring the tightest tolerances and the most exacting standard requirements. Avaplas' success has been centred on its policy of continuous improvements in quality, cost and delivery to its customers.

To enhance and optimize productivity and efficiency, Avaplas recently bought an Engel Victory 300 Tech machine which is equipped with HV 4 Hydraulic system for use in its Singapore plant. The customized production cells have resulted in enhanced production output.

Boone Quek comments: "We are particularly pleased with the performance of the new machine that was built and supplied from Korea, notwithstanding the fact that all previous machines were supplied either from Austria or Canada. Engel has always been one of our key partners in our Company's growth and it will continue to be so." <<



Meanwhile more than 20 Engel machines are in operation within Avaplas' network of manufacturing facilities. Photo right: Within less than two years, Avaplas purchased a total of five Engel MuCell Systems, ranging from 125 up to 500 tons clamping force.



South Korea: Woojeon Make the changes for the future

>> Woojeon corp. has been started as in Woojeon Precision in 1988 with its plastic injection mold and molding business to provide total solution for mechanical part. Since then, Woojeon corp. has expanded into Seoul Woojeon, Yong-in Woojeon and Dalian Woojeon.

Seoul Woojeon is developing mold produce and sales business to meet customers' demand now based on Dalian Woojeon in China since started its business in mold and molding in 1988.

"Make the change for the future" as a slogan in 2005, Woojeon put their endeavor to become a total solution provider from design to producing and delivery.

They produce parts for mobile phone through 56 sets of Engel machines with high quality of facilities over the three factories.



The major business of Yong-In Woojeon in Woojeon corp. is producing cases and parts of the mobile phone. All possible production process under one-roof accomplish the best quality and cost-effectiveness.

Future Business Plan

Woojeon will continuously grow its business and expand the production lines to satisfy the customers' needs of the present and the future:

1. In Mold Labeling: Woojeon will develop IML without spray printing process to meet the customers' demand for various designs and environment.

2. Module: Add to the solution for plastics, Woojeon will strongly pitch the proposal on many mechanical solution with design to customers.

3. Phone Design: Design which materializes new idea into production based on long time experience in parts production takes one step closer to the customers. <<

Process and facilities



>> **Parts Design:** Woojeon provides the design for the best quality product with experienced expertise in parts production.

>> **Mold:** 16-year-accumulated know-how and the wide range of production experience: Mold Flow Analysis - 2D/3D Tool



Design - CAM Data - CNC - 3D Measuring System - EDM - Mechanical Process - Tool Assembly - Try Shot - CMM

>> **Injection/Molding:** The-state-of-the-art facilities with a pyrostat system, machine monitoring system and the best equipments assure the best quality. Also the merit with-in the two-shot molding based on various molding experience satisfy the customers.

>> **Spray Painting:** The booth system equipped with a thermo-hygrostat, memory robot system and line condition check system using power map provide the constant quality guaranteed and the best productivity.

>> **EMI coating:** The customers' satisfaction is achieved by total service in non-stop EMI coating process.

>> **Printing & 2nd processing:** One factory with the ability of services in various kinds of the 2nd process meets customers' demand of the quality, cost and delivery.

>> **Assembly:** To provide not only mold and parts production but also all production process in one-stop service. This is the assembly that fits the customers' wants. <<



>> Samkwang means three brilliant lights. When the three lights, the Sun, the Moon and the Stars are together, as the light becomes ever more brilliant. Samkwang hopes to be a brilliant light over the world. Samkwang industry. ltd (www.samkwangind.com) was established in 1974. From then on, Samkwang put their tremendous efforts on quality improvement and that became their stepping stone to carry globalization which expresses their strong will to be reborn into the world.

Samkwang constantly extend its business through systematical education based on the abundant experience and know-how, forecasting the rapidly change global market, specialized management with new business network.

As one of four major mobile component company for Nokia and Samsung, Samkwang produces mobile phone cover and mobile phone window through Engel's VC two-color and three-color injection molding machines and Super Speed injection molding machine.

Presently Samkwang supply 21 % of Any-call components to Samsung. And with the opening of Kyungsan factory, sales turn-over in 2006 is expected 80 million EURO. As you can feel to see their customer, they are enough

concerned about quality and security to be introduced as a model on TV News.

Samkwang pursues the best quality of production through systematic processed with inspection of every step and the standard of international quality certificates. They were already certified ISO 9001 and ISO 14001 in 1999.

As a challenge to global enterprise, samkwang leap into the age of globalization for the first class enterprise with systematic and suitable organization. They say: "Our goal is to impress our customer more than satisfying upon our belief 'Being with our customer' is being with our future". <<



South Korea: Samkwang Industry World Class & Leading Technology

