Injection

The magazine from ENGEL for the plastics industry.

September | 2014

Hollow bodies with inlays in one step




Innovation knows no bounds

Dr. Peter Neumann
CEO ENGEL Holding

Only those with a clear view can see new ways and master them successfully. And sometimes even a simple tie bar can block the view to lower investment costs and higher flexibility.

A main topic at our trade fair stands at October's Fakuma will be the 25th anniversary of the tie-bar-less injection moulding machine. 25 years ago, tie-bar-less technology was a bold step towards a new solution for the clamping unit. Today it is regarded as a genius leap of technology. Worldwide, over 60,000 tiebar-less ENGEL machines are in use by more than 10,000 customers, proving tie-bar-less technology to be a highly successful pioneering idea, which has led to a huge advance in innovative machine technology.

Such an innovative leap, however, can only be considered valuable if it provides an increase in customer benefits. And this evaluation has to encompass the entire process, including all aspects of achievable production efficiency. After all our customers, and their customers, demand increasing levels of flexibility in the manufacturing of their plastic parts, with continually stricter quality guarantees and lower unit cost constraints. In order to meet these demands, the entire system needs to be perfectly synchronised and live up to all requirements.

Tie-bar-less technology is a success story. Even after 25 years, the system's many advantages remain unbeatable and have gained even more importance when it comes to making some investment decisions. Mould sizes, automation requirements and much more clearly favour the tie-bar-less system.

The courage to go down unconventional paths is what makes ENGEL unique. Current leaps of innovation, such as in the evolution of process integration and the development of unique services, continue this tradition. At Fakuma, we will present the next steps in innovation by manufacturing transfusion chambers, demonstrating the integration of two technologies in one process. No matter the topic – iQ weight control or ENGEL e-flomo – the articles in this current issue of Injection show that only innovative details – in pre sales as well as after sales – create maximum efficiency in the use of modern machine technology and bring out the best qualities.

Or like the company Braun says on page 19: Short set-up times for mechanically complex moulds ensure a head start, traceable back to the innovative power of the company. Those who invest in innovative technologies make their company fit for the future.

In light of current worries about political and economic challenges worldwide, we need to carry on fighting and use innovation to stay ahead of the rest. We must never lose focus on the customer benefit of our products, services and innovations.

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25
years | **tie-bar-less**

News

Retrospective

Current Events

ENGEL

ENGEL worldwide. **around the corner.**

For a large-scale machine, the ENGEL v-duo supplied to BMW Works in Landshut was designed and built in a relatively short period of time of just over a year.

Used for lightweight construction
BMW puts ENGEL v-duo into operation

On an ENGEL v-duo 3600 machine with a clamping force of 36,000 kN, BMW manufactures large structural elements from fibre plastic composites using the HP-RTM process. It is equipped with two horizontal, moving slide tables to remove finished parts and insert new fibre tissue during the pressing process. This manufacturing principle reduces cycle times and increases energy efficiency, because the mould is only open for a brief period each cycle.
The new, vertical, large-scale machine offers a clear-cut approach to economical series production for thermoplastic as well as thermoset composites. Both in overmoulding of organic sheets and tapes, and in HP-RTM processes, if often makes sense to work with gravity. This reduces the effort in the handling of parts and the fixation of insert parts in the mould, and also facilitates manual intervention.
In contrast to presses traditionally used for fibre composite applications the new vertical machine by ENGEL stands out with its comparably small footprint. In addition to this it sets new standards in terms of energy efficiency for large-scale machines.

All-electric for maximum performance
ENGEL at FIP 2014 in Lyon

Compact manufacturing cells, fast mould changes and flexible process integration were the highlights at ENGEL's exhibition at FIP in June 2014 in Lyon, France. At the trade fair stand ENGEL presented an integrated system solution for the packaging industry among other things. Drinking cups for airlines were manufactured from polystyrene on an ENGEL e-motion 160 injection moulding machine using the thin wall injection moulding method. A cycle time of under 3 seconds was achieved.
Thanks to the closed system for toggle lever and spindle the ENGEL e-motion is the preferred machine type in regulated manufacturing areas, such as food packaging production.
Further highlights at the ENGEL trade fair stand were the new control unit generation CC300 as well as optimisation tools and service products. Training and service are fixed components of the ENGEL system philosophy all over the world. In keeping with this, the company's sales and service subsidiary in Wissous near Paris is also equipped with its own training centre, which is the venue for regular customer training sessions, workshops and conferences.

At FIP drinking cups for airlines were manufactured on an ENGEL emotion 160 injection moulding machine.

From a single source
ENGEL cooperates with Fill

ENGEL AUSTRIA and Fill, which is headquartered in Gurten, have put a seal on their partnership in the area of composite manufacturing. The two Upper Austrian companies will be working together to produce tailored turnkey solutions for the industrial manufacturing of fibre-reinforced plastic components.
“The aim of our partnership is to meet the demands of the market even more effectively and drive the industrialisation of composite processes forward even faster,” says Franz Füreder, Vice President of ENGEL AUSTRIA's Automotive business unit. “We are delighted that in Fill we have found a partner whose technologies are also the world's best and who, like ENGEL, prioritises

ENGEL and Fill will be working together to produce tailored turnkey solutions for the industrial manufacturing of FRP components. (Pictures: NMB, Fill)

research and development."

Components made from fibre-reinforced plastics (FRP) play a key role in automotive lightweight construction. At the moment, the biggest challenge is developing economic processes for the mass production of innovative composite parts.

With its system and automation expertise, injection moulding machine manufacturer ENGEL already has one success factor that is crucial for this. Fill enhances ENGEL's product portfolio in the area of preform manufacturing and processing.

"Interdisciplinary competence is absolutely essential if an FRP project is to be successful."

Franz Füreder, Vice President of ENGEL automotive

In lectures and with the use of sample parts, ENGEL and Borouge presented innovative materials and processing technologies.

With a production volume of 2.4 million vehicles annually, Thailand is among the top ten automotive nations. Almost all major automotive producers and OEMs have their own works in Thailand. ENGEL has addressed this high market significance by establishing a Bangkok subsidiary.

Technologies create added value
Automotive seminar in Bangkok

Lower weight, more comfort and lower unit costs – such are the automotive industry's requirements for vehicle components. Integrated plastics solutions play a decisive role in meeting these requirements. During their automobile seminar end of June in Bangkok, the partner companies, ENGEL and Borouge, presented what this could look like in practice.

The event was attended not only by automotive experts from Thailand, but also from Malaysia, Indonesia and other South East Asian countries. All in all, ENGEL and Borouge were able to welcome 130 guests. "The automotive industry is our biggest market," says managing director of ENGEL Machinery (Thailand) in Bangkok, Gilles Lefevre. "ENGEL is already one of the leading suppliers in the region."

Preview 2014

Expo Plast, Bucharest/Romania, 24th-27th September

Iranplast, Teheran/Iran, 25th-29th September

Plastex, Brno/ Czech Republic, 29th September – 3rd October

Colombiaplast, Bogota/Colombia, 29th September – 3rd October

Interplas, Birmingham/Great Britain, 30th September – 2nd October

Equiplast, Barcelona/Spain, 30th September – 3rd October

Composite Europe, Düsseldorf/Germany, 7th – 9th October

Fakuma, Friedrichshafen/Germany, 14th – 18th October

Plastimagen, Mexico City/Mexiko, 18th – 21st November

Plast Eurasia, Istanbul/Turkey, 4th – 7th December

Detailed information and appointment arrangements: sales@engel.at

ENGEL med.con
established as a networking event

Uncompromising cleanliness, maximum product safety, economic efficiency – ENGEL med.con 2014 provides answers to current and future challenges in medical technology.

Since the first ENGEL med.con four years ago, the medical conference has become an integral part of the injection moulding machine manufacturer's event calendar. Worldwide it is among the ENGEL events that attract the largest attendance. "The ENGEL med.con has established itself as a kind of networking event," explains Christoph Lhota, Vice President of the Business Unit Medical at ENGEL AUSTRIA. "Our customers and partners use this platform to exchange ideas and to keep informed about current trends, innovative products and methods. Participants often tell us that many of these ideas can be implemented straightaway." After successful events in the US, China, Germany and France, there are further dates on the agenda until the end of November. ENGEL will be using live exhibits and focus on the topics of process integration and peak performance. Furthermore, there will be specialised lectures about success factors and market opportunities, as well as a partner fair. "The key to success in medical technology lies in cooperative partnerships between the companies along the value added chain," says Christoph Lhota.

ENGEL med.con 2014

Mirandola/Italy, 17th and 18th September
Copenhagen/Denmark, 6th November
Warwick/Great Britain, 27th November

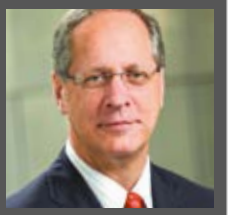
Further details and registration:
medical@engel.at

Successful events in the USA and Shanghai

"Medical technology and health care are important growth markets in China," stresses Gero Willmeroth, President Sales and Service of ENGEL Machinery Shanghai, where more than 50 manufacturers attended med.con in May. Beside the major international groups, also an increasing number of smaller businesses are investing in these sectors. They often still lack industry-specific know-how, which is why they have to rely on ENGEL's system solution competency and the many years of experience.

Gero Willmeroth

Also in the US the demand from the field of medical technology is at a very high level. The team of ENGEL North America had the pleasure of welcoming more than 200 guests to not one but two Medical Day events. The first took place in March at the subsidiary headquarters in York, Pennsylvania, the second a month later at the Technical Center in Corona, California. "With Medical Days, we commit time and resources to assist our customers who are facing new challenges in supplying an ever-changing medical landscape," says Mark Sankovitch, President ENGEL North America. "Trends such as an aging population, point of care shifting to the responsibility of the patient and new government mandates are altering the requirements of the medical device manufacturers here in the United States."



Mark Sankovitch

Over the next four years, ENGEL Machinery Shanghai will train 10 young men as CNC technicians. Werner Wurm, an instructor at ENGEL headquarters in Schwertberg, Austria (left), assists with training on site. His Chinese colleague Li Taoxian (right) was trained in Austria.

ENGEL exports dual vocational training

First apprentices
start training in Shanghai

To ensure the rising demand for skilled workers is met, ENGEL has always invested heavily in internal training: some 150 apprentices are currently training at the three Austrian sites. Now for the first time, apprentices are also being taken on at the large-scale machine facility in Shanghai.

Ten young men have already made a start: over the next four years, ENGEL Machinery Shanghai will train them as CNC technicians. "We are expanding rapidly in China, where we always have a high demand for skilled workers," points out Dr Peter Neumann, CEO of ENGEL. "Finding qualified staff in China can be difficult, though, because in many areas their state education does not measure up to our high requirements. That's why we took the decision to set up our own training programme in China as well."

In contrast to most other apprentices in China, ENGEL trainees gain a thorough practical grounding on the job from the first year onwards, and receive payment. ENGEL designed the new training workshop along the lines of its workshop at the company headquarters in Schwertberg, which has attracted national awards; the new facility is similarly equipped with state-of-the-art machinery. The trainers themselves were trained in Austria. Trainees are now undergoing 12 weeks of practical training and six weeks of classroom instruction alternately. At the end they receive a qualification equivalent to the Austrian standard that is recognised in both China and Europe.

Training the trainers in Austria

In setting up a dual vocational training programme, ENGEL is emerging as a pioneer in China. Together with partner firm ALPLA Werke A. Lehner GmbH & Co. KG of Hard in Austria, ENGEL has put in place the infrastructure necessary for this. The two companies viewed various training facilities around Shanghai before finding the ideal partner in the Shanghai Information Technology College (SITC). The SITC is already running a special class devoted to the theoretical training of prospective CNC technicians.

"To ensure the SITC instructors could gain a clearer understanding of the dual training system, we invited them to Austria. While they were here they familiarised themselves with the apprenticeship programme at our plants and in a vocational school," recalls Michael Grininger, Head of Human Resources at ENGEL.

The aim is to attend one training class at the SITC every year to expand the programme as early as the next cycle of training. In future, young men and women will also be trained as plastics technicians in Shanghai – to European standards.

ENGEL's new training workshop in Shanghai is equipped with state-of-the-art equipment and machinery.

Welcome
to the ENGEL stand at Fakuma 2014

Barrier-free mould area, compact manufacturing cells and a high capacity for innovation: ENGEL will be celebrating 25 years of tie-bar-less technology at Fakuma 2014, which takes place in Friedrichshafen, October 14 – 18.

In the East Foyer, an ENGEL victory 80 will impressively show how tie-bar-less injection moulding machines can continue to meet the highest demands in terms of efficiency and cost-effectiveness. The tie-bar-less machine fitted with energy efficient ecodrive drive technology and the new CC300 control unit will produce fittings for drainage systems – an application designed to showcase the advantages of tie-bar-less technology to best effect. Although the mould is of substantial size with its large core-pulls, it can still be attached to the 80-ton machine quickly and conveniently. With no tie-bars to interfere with the mould, mould mounting platens can be used up to their edges and very large moulds can be mounted on relatively small injection moulding machines. This enhances overall efficiency. Smaller machines require less energy, and most importantly take up less space.

>> East Foyer, Stand FO-03

"Because of the pressure of costs in many sectors, the number of cavities is rising and moulds are getting bigger. Compared to mould size, though, the actual clamping force requirement has remained relatively low in the production of technical parts. Tie-bar-less technology has enabled us to turn the tide of spiralling costs by installing smaller machines."

Franz Pressl, Product Manager ENGEL victory

Learn more about the ENGEL tie-bar-less technology

- **The ENGEL YouTube Channel with practical examples**
  www.youtube.com/user/injectthefuture/playlists
  > 25 years ENGEL tie-bar-less technology
- **25 years of tie-bar-less technology – the anniversary on the Internet**
  www.engelglobal.com/tie-bar-less

Fakuma highlights from the ENGEL Business Units

>> Hall A5, Stand A5-5204

Teletronics: ENGEL e-motion 50 TL and it's world premiere in Friedrichshafen

The new tie-bar-less and all-electric ENGEL e-motion 50 TL will produce 15-pin plug housings from fibre-glass-reinforced PBT/ASA. The 15 contact pins in the finished connector are very close together, and the moulded grid structure is equally fine with wall thicknesses and edge lengths in the range of micrometres. In this market segment, all-electric machines are the standard. To offer highly compact manufacturing cells, ENGEL combines all-electric drive technology with a tie-bar-less clamping unit in its ENGEL e-motion TL small machine range. Having unveiled the ENGEL e-motion TL with an initial clamping force of 30 tons at K 2013, ENGEL will be upgrading the new series to include a 50-ton version at Fakuma 2014. As with the smaller variant, the new ENGEL e-motion 50 TL features a one-piece machine frame that makes the injection moulding machine lighter and more compact than comparable all-electric machines of other types.

The new ENGEL e-motion 50 TL will demonstrate its high precision by producing plug housings at the trade show.

"The trend towards ever higher productivity per square metre of factory space is continuing. We believe there is a great deal of potential for tie-bar-less injection moulding machines in the electronics industry."

Heinz Rasinger, Vice President ENGEL teletronics

Automotive: Technology integration opens new vistas of quality

The trend of process integration as a path to greater efficiency, safety and quality is well established. Now it is necessary to adopt a more diversified stance. The object is no longer simply to integrate process steps upstream or downstream of injection moulding, but also to combine different process technologies with one another. To produce centre console components in PC-ABS at its trade show stand, ENGEL will be using an ENGEL duo 2550/550 injection moulding machine with integrated ENGEL viper 20 robot to combine two technologies: ENGEL foammelt, the MuCell foam injection moulding process developed by Trexel, and ENGEL variomelt, a variothermal injection moulding process using a Roctool mould. To demonstrate the versatility of this amalgamation of processes, the sample part will have varying wall thicknesses and surface structures. Thanks to ENGEL foammelt the cavity, including the undercuts, is completely filled, and the component has no sink marks after cooling; meanwhile variothermal temperature control provides a high gloss finish.

The new design of the ENGEL duo injection moulding machine will be unveiled at Fakuma 2014. Users will benefit from improved ergonomics thanks to a lower operating height and easier access to the mould and nozzle area.

The speed, flexibility, compactness, energy efficiency and ease of use of the ENGEL viper robots have all improved.

"For the first time, we are able to produce thin-walled parts with very high quality surfaces and excellent fine structure consistency at the same time in a single injection moulding step."

Franz Füreder, Vice President ENGEL automotive

Medical: Process integration of highest perfection

In the Medical section of its stand, ENGEL will be producing drip chambers with integrated filter for blood transfusions using an ENGEL e-victory 160 combi tri-component injection moulding machine with ecodrive and a clean room design. Injection devotes a detailed report on this highly innovative method starting on page 14.

"Drip chambers are mass-market products that need to be manufactured economically despite the stringent demands on product safety and hygiene."

Christoph Lhota, Vice President ENGEL medical

Packaging: All-electric for maximum performance

ENGEL's Packaging business unit will be presenting an all-electric injection moulding machine in Friedrichshafen. 500 ml food containers will be produced on an ENGEL e-motion 160 featuring a 2-cavity mould. In-mould labelling (IML) will be used to decorate the container.
The newest machine generation is able to achieve cycle times of well under three seconds and injection speeds of more than 500 mm per second, thereby combining maximum performance with maximum energy efficiency. The closed system for toggle lever and spindle always guarantees optimal, clean lubrication of all moving machine components. This makes the ENGEL e-motion the preferred machine type even in regulated areas such as food packaging production.

Fit for high performance: An all-electric ENGEL e-motion machine will produce food containers in Friedrichshafen – including IML

"The steady enhancement of the ENGEL e-motion series is serving to establish the machines in the field of high performance applications for the packaging industry."

Kurt Hell, Sales Manager ENGEL packaging

Technical Moulding: Efficient use of LIM multi-component processes

The main demands as regards the processing of liquid silicone (LSR) are that it must be fully automatic, waste-free, low in burrs and require no reworking. An ENGEL e-victory 120 combi injection moulding machine – automated with an ENGEL viper linear robot – will impressively show that ENGEL system solutions not only meet these requirements fully, but also handle LIM multi-component processes securely and efficiently. Sensor housings for flow measurement with integrated seals will be produced. Developed and patented by ENGEL, iQ weight control software applied in the system recognises and automatically compensates for fluctuations in melt quantity during the actual injection process. The ENGEL tie-bar-less technology also makes a decisive contribution to high process stability in this application, while the patented force divider evenly introduces force to the mould across the platen face. Both outer and inner cavities are thereby kept closed with precisely identical force, significantly reducing mould wear and raising product quality. On top of this, free access to the tie-bar-less machine's mould area facilitates the most effective automation concepts.

In the technical moulding section of its stand, ENGEL will demonstrate the production of sensor housings with integrated seals.

"We can guarantee maximum precision by using servo-powered injection units. Normally the LSR field requires special solutions where very small injection unit volumes are involved. In this case we meet that need with a standard unit."

Leopold Praher, Sales Manager ENGEL elast/LIM

ENGEL plus: ENGEL e-flomo is taking control

At the Fakuma event, ENGEL will devote a special presentation area to ENGEL plus, the name for its service products and optimisation tools. The main theme of the display will be intelligent mould temperature control. The compact temperature-control water distribution system has manual settings and can be integrated into a machine; electronic monitoring has increased process reliability and simplified process optimisation in more than a thousand new machines to date. For Fakuma 2014, ENGEL will be taking the next step from process monitoring to process control. The newly developed ENGEL e-flomo has electric control valves that make it possible to adjust and control flow rates fully automatically; ENGEL will demonstrate this live at the trade fair.

ENGEL e-flomo keeps the temperature in the mould constant throughout the production period, even where water pressure varies. This results in greater efficiency, process reliability and consistently high product quality.

"Although mould temperature control has a major influence on the productivity of the manufacturing process as well as component quality, we tend to pay too little attention to this aspect."

Wolfgang Degwerth, Head of the Customer Service division at ENGEL

ENGEL and partners: lean and environmentally friendly

ENGEL's green machines and system solutions will be on display at the ENGEL stands and also at several partner stands throughout Fakuma 2014.
For example in Hall A5 (A5-5312) Kunststoff-Institut Lüdenscheid will also be manufacturing on a tie-bar-less machine. An ENGEL victory injection moulding machine will be used to produce business card boxes. With this application, the Kunststoff-Institut Lüdenscheid will present a passive Greenmold concept that works without an additional active heat source and can fully suppress the formation of streaks even at approximate mould wall temperatures of 60 °C.

Together with partner exhibitors pi4_robotics and Impact Coatings, EHLEBRACHT Kunststoff-Technik will show in hall A1 (stand A1-1205) how the injection moulding process, surface finishing and handling (including quality assurance) can be integrated in an efficient and space-saving manner using a tie-bar-less ENGEL victory injection moulding machine.
ROS will focus on precise moulding for particularly complex component geometry. An all-electric ENGEL e-motion 200/110 injection moulding machine will produce impellers for use in automobile coolant pumps in hall A5 (stand A5-5104).

25 years of tie-bar-less technology – the anniversary on the Internet
www.engelglobal.com/tie-bar-less

Close to the customer – a constant challenge

The relevance of customer proximity is increasing. This sounds a lot like a common set phrase. How close do you as a company want to be to your customers? Consistent customer proximity, however, demands a lot and repeating a catch phrase is not enough.
Customer proximity in “pre sales” means that the customer is advised by a professional consultant who knows the customer's branch-specific requirements and helps to implement an application-oriented solution. But even that is not the end of the story. The growing internationalisation demands not only a branch-specific adaptation, but also an insight into the respective region, because different countries have completely different requirements. Gaining this insight requires the production site to be in close proximity to the customer and an extensive consultation be carried out by sales employees who know what the relevant market really needs. Thus, packaging solutions with identical specifications can turn out quite differently in different markets.

A good feeling for global markets

ENGEL comprises 29 subsidiaries and eight production plants worldwide, ensuring swift action, professional competence and cost-effective solutions. To achieve this, a lot of experience in the markets as well as the branch-specific technical solutions is required. But that is not all. Many products start with a simple idea. To make such an idea a success, listening, understanding and treading innovative paths are required. And those who tread new paths need applications technology expertise as well as sensitiveness when it comes to implementation. Those who also find solutions optimising productivity and economic efficiency can convince customers and win them over.
And this brings us straight to “after sales”. To put it simply, after sales means optimum machine and production efficiency. The customer receives a solution from the machine manufacturer and the task at hand is to ensure the highest level of efficiency for this solution. Not only as single machine, but also in the integrated production process. There are a plurality of adjusting screws, which need to be turned so that investing in an injection moulding solution will bear fruit every day and in the long run. Machine operators need to be trained perfectly, spare parts need to be installed rapidly and globally, the availability of the machine park has to be guaranteed at the highest level – by means of maintenance contracts, oil maintenance or everQ. This too is about individually adjusted solutions with a single goal: to maintain the machine and system solutions at highest performance and availability levels.

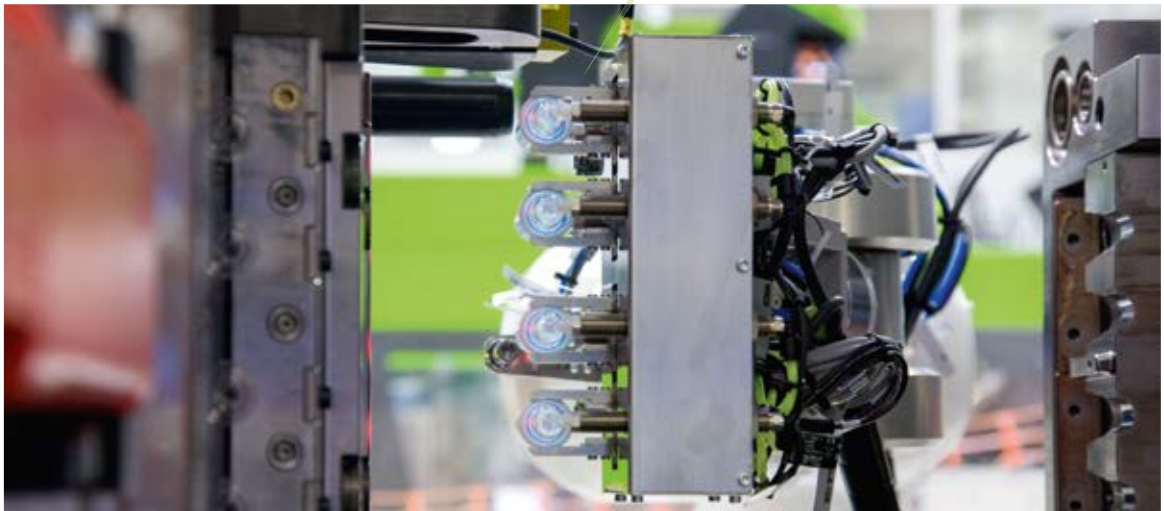
Always open to change

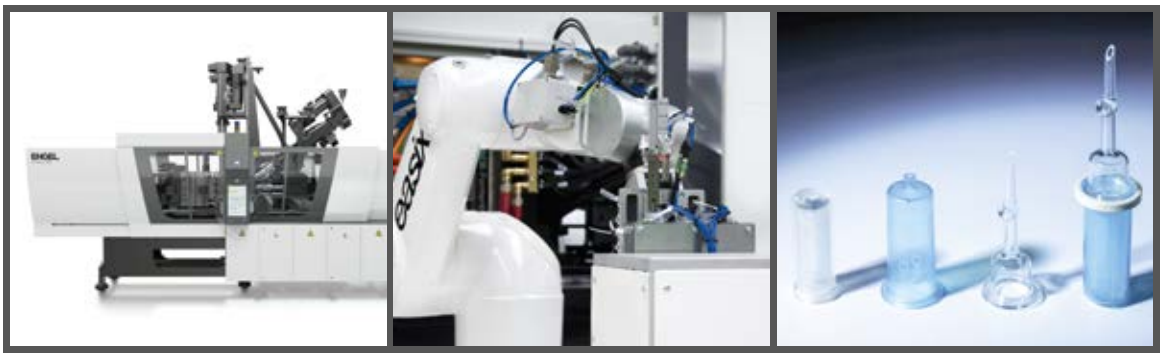
The product portfolio ENGEL uses to satisfy these requirements is ENGEL plus. ENGEL plus means knowledge transfer, retrofit, consulting and tailored products which increase the efficiency of the machine operation. The demands are strongly controlled by the product's life cycle. The shorter the shelf life of a plastic part, the more flexible the machine supplier has to be to ensure the efficiency of the provided machine solution even in case of frequently changing requirements. This requires “transforming” the existing machine repeatedly, quickly and at low cost into a new solution which meets the new demands. In the telecommunications field, for example, this happens in a cycle of meanwhile less than six months.
As a family business with a unique comprehensive market coverage through experts for machines, applications and automation, ENGEL continues to invest in the permanent expansion of its global production and sales capacities. ENGEL relies on experienced employees and the systematic advancement of its experts. These experts do business every day in close proximity to the customer. Only this allows them to understand the needs of the customers – today and also in future. And only in this way can ENGEL be a reliable and competent partner for its customers in any branch and in any region.

Hollow bodies with inlays **in one step**

Modern medicine would not be the same without infusion and transfusion therapy. Drip chambers have long ago become standard products for these applications, and can be produced economically while meeting the highest requirements for manufacturing safety and hygiene. For the first time, together with its system partner, HACK Formenbau, ENGEL AUSTRIA succeeded in manufacturing multi-component hollow bodies with inlaid filters using an injection moulding machine in a single work step. At Fakuma 2014, ENGEL will be presenting this highly integrated process which could lead to new trends in other branches as well.

The drip chambers consist of two different materials. The upper part forming a unit with the piercing spike is manufactured from a more rigid material, while the lower part consists of a softer material to enable aspiration. For transfusions an extra filter is inserted.
When it comes to series production, current state of the art is a three-stage process. As a first step, the upper and lower parts are manufactured in separate injection moulding processes using moulds with a high number of cavities. The parts are automatically removed and transferred to the second step, assembly. If used for transfusion sets, a filter is fitted into the lower part of the chamber. In the third processing step, the two pre-assembled parts are either bonded or inserted into another injection moulding machine, and are inseparably connected by moulding on a thermoplastic ring. These three processing steps require two to three injection moulding machines, an assembly unit, and a bonding station, if applicable. Add to this the logistics overheads for handling, transportation, and temporary storage of feedstock.
The newly developed manufacturing process integrates the injection moulding processes for manufacturing the two chamber parts, fitting, and overmoulding of the two halves of the component in a single production cell. A 4-cavity demonstration mould is used for the trade fair presentation. The automation is provided by an ENGEL easix multi-axis robot which is fully integrated into the machine control unit.





The drip chambers consist of a total of four components: a rigid upper part with piercing spike (ABS), a softer lower part (PP), a filter, and a ring, inseparably connecting the upper and lower parts (PP).

The degree of process integration poses a particular challenge for mould building, because the two project partners did not want to fall back on the traditional concepts for overmoulding two component halves. While sliding tables extend cycle times, rotary tables and double cubes will lead to very complex, large moulds. For this reason, ENGEL and HACK decided on a completely new system. They employed a core-segment rotation technique based on two rotating shafts; the pre-moulds are lifted from the mould, rotated by 180°, and inserted into the mould for overmoulding. It should be noted that the upper and lower parts are not joined by simply placing them on top of each other; rather the lower part is pushed to a certain extent into the upper part. In order to keep the pre-moulds during their 180° rotation from colliding, the cores have to perform a linear movement before they rotate. This is achieved by raising the rotary cores using a connecting link.

The filters are inserted after the advancing of the rotary cores, but before their rotation. The filters have to be securely fastened in the lower component half to keep them from falling out during the rotation. The inner diameter of the drip chamber's lower part plays a significant role, because the filters can only be kept in place by a light press fit. The pressing force, however, must not be too high or it can cause deformation of filters or warping of the lower parts of the drip chambers. At the same time the filters are placed, the gripper takes a set of finished parts out of the rotary cores. The ENGEL easix transfers the finished parts to a full quality control before depositing them on a conveyor belt.

Maximum safety, minimal footprint

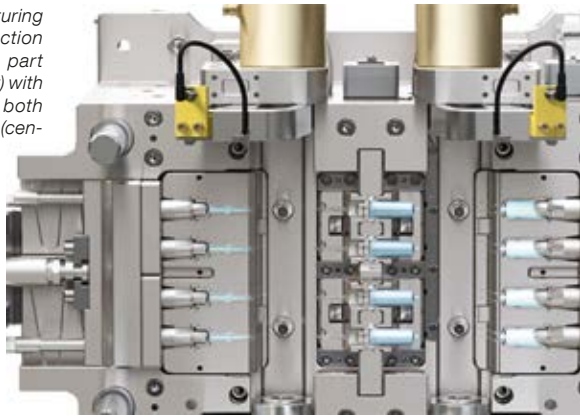
The ENGEL e-victory injection moulding machine contributes further to the high efficiency of the method. Due to its lateral servo-electric core pulls and the upwards protruding servo-index shafts, the mould needs a large installation space, while its application only requires a relatively low clamping force. Since injection moulding machines of the ENGEL evictory series are tie bar-less, significantly larger moulds can be mounted than on machines with tie bars and a similar clamping force. This means that a relatively small injection moulding machine is used for manufacturing the drip chambers. Furthermore, the mould does not have to be disassembled for mounting.

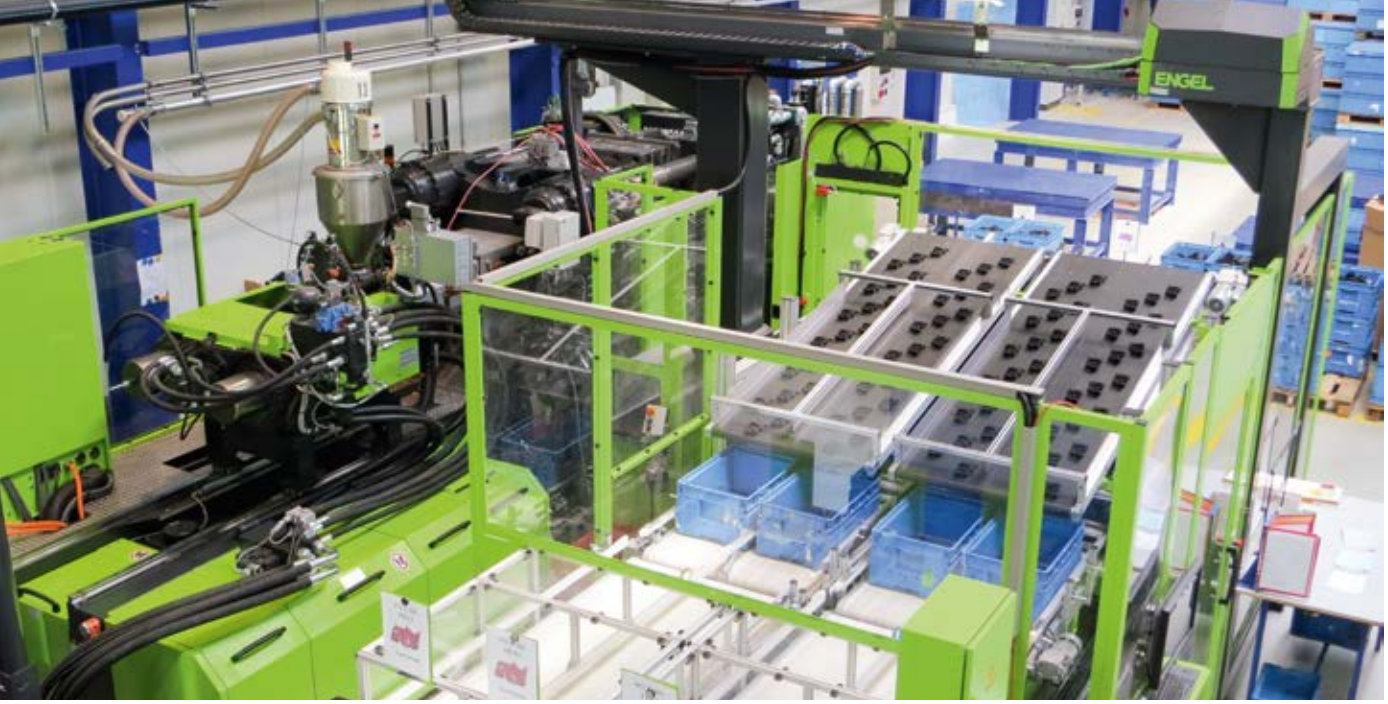
The ENGEL e-victory is a hybrid machine with a servo-hydraulic clamping unit and servo-electric injection units, which account for high levels of precision and reproducibility: Above all, the injection of the third component to seal both chamber halves is a crucial point in the production of drip chambers. Since the pre-moulds are hollow bodies, there is a risk of part deformation if the cavity pressure is too high, which would lead to rejects, The software iQ weight control is used to prevent this.

Not only for medical

All told, the highly integrated process significantly reduces the amount of time and money needed to produce multi-component hollow bodies, increases process reliability and takes up comparatively little production space. The interest of the industry is considerable and inquiries are by no means limited to medical technology. In general, the method is suited for many kinds of hollow bodies that consist of different materials and need to be absolutely leak-proof, for example brake fluid reservoirs or fuel filters in automobiles. At Fakuma, the ENGEL technology experts will be available to start off further potential applications. Both the ENGEL e-victory machine series and the mould concept allow for a fast scale-up.

The integrated manufacturing process combines injection moulding of the lower part (right) and upper part (left) with the overmoulding of both halves of the hollow body (centre) in a single step.





As general contractor ENGEL supplied the injection moulding machine, process technology and automation.

Light-**weight** and sustainable

Up until three years ago, Pollmann's plant in Jindřichův Hradec – also known by its German name Neuhaus – was solely an assembly plant. Since then, the share of injection moulding processes has been increasing gradually, which led to ever growing demands the tier 2 supplier places on its South Bohemian site. The certification according to the ISO 14.001 standard for environmental management will be one of the next milestones. Now that Pollmann's headquarters in Karlstein an der Thaya, Austria, is certified, the preparations to build up environmental management systems at the Czech site have started. "Environmental protection and energy efficiency are the focus of every new project," stresses Manfred Jäger, the Pollmann Group's person in charge of procurement of investment goods. The challenge is to reconcile sustainability with the technological requirements and high cost-efficiency.

Electromechanical modules for automobiles are a main focus in the manufacturing portfolio of the family business. Entire modules as well as individual components are being manufactured both in Austria and the Czech Republic. This comprises numerous metal/plastic composite products with a plurality of integrated functions, such as sunroof guides or door locks.

"Our customers are ordering complete packages more and more often," says Jäger. "This means that we construct the component according to the requirements, manufacture the mould, develop an efficiency-optimised production process and adjust the manufacturing volume constantly to the rising number of pieces ordered." This was also the case with Kiekert from Heiligenhaus in Northrhine-Westphalia. In November 2012, the expert for door locks put Pollmann in charge of the development and series production of a new generation of door lock cases, which meanwhile is being used in various car types.

The new two-part cases were supposed to weigh twelve percent less than the previous models. This objective is met thanks to physical foaming. The upper parts of the cases are manufactured from glass-fibre reinforced polypropylene using the MuCell technology. Pollmann invested in two completely new highly automated manufacturing cells. The centrepiece of both manufacturing cells is an ENGEL duo 500 pico injection moulding machine with ecodrive. An ENGEL viper 40 linear robot, eight conveyor belts and an automatic box changing system were integrated into each manufacturing cell to handle the parts. Every 20 minutes eight boxes containing 100 parts come off the conveyor belt of each of the manufacturing cells.

Reliable filling of undercuts

"When it comes to reconciling sustainability and efficiency, the MuCell technology is virtually the perfect choice," emphasises Werner Sucharda, area sales manager at ENGEL AUSTRIA. ENGEL offers integrated system solutions under the name of ENGEL foammelt for the structural foam moulding process MuCell, which was developed by Trexel. During the MuCell process a gas is injected under pressure into the plastic melt as a physical blowing agent. This reduces the raw material consumption and the weight of the component sinks. Furthermore, the flowability of the melt is increased so that all corners and undercuts are also filled. "The door

From left to right: Christan Zwettler and Manfred Jäger of Pollmann International, Werner Sucharda of ENGEL Austria, Michael Hauer of Pollmann CZ, Gerald Hauer of Pollmann Austria, Petr Lorenc and Pavel Kandus of Pollmann CZ.

The larger of the two case parts (pictured above) is manufactured using ENGEL foammelt.

lock case is a demanding three-dimensional component," explains Gerald Hauer, responsible for the internal relocation of injection moulding processes at Pollmann and member of the project team. "Thanks to ENGEL foammelt we achieve a very stable process despite the many undercuts."

A single contact person for the whole project

8-cavity moulds are used for both the lower and the upper part, producing four right and four left parts in every cycle. After the injection moulding, the ENGEL viper 40 robot removes all eight parts at once and sorts them by depositing them on the respective conveyor belts. Pollmann put ENGEL as general contractor in charge of providing the manufacturing cell. Apart from the injection moulding machine, the process technology and the automation, the package also comprised the integration of a cooling system as well as a mould monitoring system from other suppliers. "In total, the control unit of the ENGEL machine controls the parameters of six different production cell components," stresses Michael Hauer, Plant Manager of Pollmann CZ. "This allows us to simplify the operation of the manufacturing cell significantly."

For Manfred Jäger another aspect is in favour of buying the entire equipment from a single manufacturer: "There is just a single interface. This means there is one contact person for the whole project, the project handling is less time consuming and the large purchasing volume allows for better purchasing conditions." The manufacturing cell for the Kiekert door lock cases was designed, constructed, optimised and launched in just a little over six months. At the same time a completely new production hall was constructed.

Reduce infrastructure costs too

Since autumn of 2013, the first of the two new plants has been producing in series, the second will take up operation this autumn. The new solution meets the target not only in terms of product quality and process stability. Thanks to its elaborate energy concept it even exceeded the goals with regard to sustainability. "We were able to use a 40 percent smaller ventilation system than planned," says Christian Zwettler, Head of Facility and Environmental Management at Pollmann. This is mainly due to the ENGEL servohydraulics. "Ecodrive has meanwhile become standard for us. We have compared measured values of several machines and it turns out that we save on average 58 percent of energy."

As expert on environmental technology Christian Zwettler is involved in any new projects right from the start. His goal is to keep both the energy consumption and the waste heat as low as possible. Waste heat that cannot be avoided is recovered and used for heating purposes. Also the cooling system of the manufacturing cell is integrated into the plant's technology. "Thanks to these measures we save energy and several hundred thousand euros in infrastructure costs," Zwettler sums up. "Not every machine manufacturer can offer this in a comprehensive package."

Turning to constant quality

Producing moulded parts of a consistently high quality shot by shot is the aim of every injection moulder. The iQ weight control process control puts this objective within reach.

To be able to shave the top lip, chin and cheeks with the same precision, the razor head needs to be able to tilt flexibly. In the Braun Series 5 and 7 electric razors, the motor rotation is converted into linear motion by means of an oscillating bridge piece. With wall thicknesses between 0.3 and 1.5 mm and a flow path length of 4 cm, these oscillating bridges made of non-reinforced polyphenylsulphone (PPS) are some of the most challenging functional components that Procter & Gamble Manufacturing GmbH Braun injection moulds at the Walldürn plant in Germany.

The facility is a competence centre for high-precision functional components within the Procter & Gamble Group. It is quite common to see production tolerances in the range of a few hundredths. Series 3, 5 and 7 electric razors, and the entire range of epilators are produced at Walldürn, where Braun combines injection moulding, assembly and packaging. "We need to demonstrate every day that we are capable of producing in a competitive way in a high wage level country like Germany," as Frank Breunig, the production planner at Walldürn emphasises. "Our challenge is thus to always stay one step ahead in technology."

Compensating for setpoint deviations in same shot

The processes are constantly reviewed. To continue improving product quality and efficiency, while at the same time reducing rejects and cycle times, Braun continually invests in new production equipment and innovative process technologies. For example, the injection moulder was among the first companies worldwide to deploy iQ weight control, the process control system developed and patented by ENGEL AUSTRIA. The first tie-bar-less ENGEL e-victory injection moulding machine with iQ weight control was purchased in November 2012. With a clamping force of 1,600 kN, and a second injection unit, a machine with larger dimensions was deliberately chosen to be able to test the new software with a variety of products. "We achieved the best results with the oscillating bridges", says Jürgen Morschek, Group Leader Process Technology at Braun's Walldürn plant summing up the comprehensive range of tests. "With their thin walls and long flow paths, these components are predestined for iQ weight control."

On injection moulding machines with electric injection units, iQ weight control analyses the pressure profile at screw positions in real time during the injection process and compares the measured values with a reference cycle online. Based on this, the system computes a new set of process parameters which allow changes in the injected melt volume and material viscosity to be detected immediately. "If deviations from the setpoint occur, the system responds immediately and automatically readjusts – without affecting the cycle time – still within the same shot", as Falk Boost, a sales engineer at the ENGEL Deutschland Technologieforum Stuttgart explains. This means that the injection profile and the switchover point are individually optimised in each cycle, keeping the cavity fill constant when switching over to post injection pressure. "This helps to compensate for the effect of process fluctuations on product quality and reliably prevents rejects", says Boost.

The oscillating bridge is an important functional component in series 5 razors

From left to right: Braun's Jürgen Morschek, Peter Mechler and Frank Breunig with Falk Boost from the ENGEL Deutschland Technologieforum Stuttgart.

Braun uses a 4-cavity mould for producing oscillating bridge pieces. The injection point is at the centre, however, filling the cavity is anything but trivial due to the various deflections and changes in wall thickness. There are two main reasons for rejects in manufacturing the oscillating bridge parts: firstly, parts with an incomplete fill, and secondly distortion that occurs if the shot volume is too high because the parts then block during take-off.

This has meant process optimisers shifting their focus to the oscillating bridges several times over the years. By changing from a machine with a hydraulic injection unit to an injection moulding machine with an electric injection unit, rejects were finally reduced to less than one percent. However, this success by no means makes time-consuming and expensive manual 100 percent checks superfluous. “One major problem is fluctuations in raw material batches”, as the Operating Department Manager, Peter Mechler, emphasises. “The tolerances guaranteed by the manufacturer are too big for thin wall applications.”

Weight constancy improved by 85 percent

The data for determining the influence of iQ weight control on process consistency in the production of oscillating bridges were acquired and evaluated in the scope of various test series. They took place as part of a project performed by Süleyman Akseven from the Dual University of Baden-Württemberg DHBW in Mosbach, Germany. Under exactly the same conditions, the oscillating bridges were produced on the ENGEL e-victory injection moulding machine with and without iQ weight control. 30 shots were sampled in each case and each component was weighed with a precision of three decimal places. While the minimal shot weight in both cases was 5.196 g, there were major discrepancies in the maximum weight. Without iQ weight control, some parts weighed in at 5.216 g. With iQ weight control, the heaviest part weighed 5.199 g. Thanks to the software, weight fluctuations were reduced from 0.02 g to 0.003 g. This is equivalent to a weight constancy improvement of 85 %. All the parts were manually checked using a gauge. Assuming 0.1 % without iQ weight control, it was possible to reduce the rejects for this component to 0.047 %, less than half.

“The results of the test series are unambiguous and reproducible”, says Frank Breunig. “We are now totally satisfied with a reject rate of 0.047 percent. Based on this, we have been able to reduce the quality control overhead, and thus improve the efficiency of the manufacturing process.”

For each component, Braun develops a separate tailor-made process and quality control solution. Interior mould pressure sensors and cameras are used, too. “iQ weight control is now another module in our process control strategy”, says Breunig. “Our next objective is to combine the software with interior mould pressure sensing. This will offer us more optimisation potential for some products.” The current version of iQ weight control is already equipped for this.

Staying ahead through innovation

Gaining a competitive advantage with innovative technologies is a fixed part of Braun's enterprise vision. As an example, Braun in Walldürn was an early adopter of ENGEL's tie-bar-less technology.

"We have many mechanically complex moulds, which are relatively large compared to the shot weight we actually need. Tie-bar-less injection moulding machines are the perfect solution for this. Access for mould set-up is perfect, solenoids and all the supply connections can be placed exactly where they are needed. This means that we can set up the mould very quickly", says production planner Frank Breunig. “We know we can rely totally on the stability and platen parallelism.”

Today, of the more than 70 injection moulding machines at the location, only 15 have tie-bars.

Innovation knows no bounds

Only those who have a clear view can see new ways. That's why we at ENGEL are always open to new ideas. We welcome inventive thinking in the plastics industry – in the shape of injection moulding technology that gives your imagination free rein. It's been 25 years since the launch of the ENGEL victory, the injection moulding machine with the revolutionary tie-bar-less design that allows limitless innovation. Free yourself from the conventional, and do the impossible.

Engel – more than a machine

Now more than ever before, Engel offers its customers clear advantages, in terms of innovative injection moulding machines, automation, processing technology – and value for money!

Engel viper robot

Engel CC 300 control system

K 2013 huge success for Engel Austria

K 2013 exceeds Engel Austria's expectations. Spotlighting the topics of system integration and automation, Engel's total of 25 machine exhibits focused on the future buzz topics of the global injection moulding industry, attracting many new customers in the process. Visitors were excited above all about the new Engel CC 300 control unit generation, which takes the overall efficiency of the system to another dimension.

CC 300 control unit generation sets a new trend

The Engel booth in Hall 15 was well visited throughout the K show. Many trade fair visitors took this opportunity to try out the new control unit generation by Engel. They experienced a totally new control solution that still looked familiar at a first glance.

"Devices like our smartphones, which we use every day, acted as the role models for developing the user interface," reports Engel Austria chief executive Dr Peter Neumann. "At the same time, the central control element, e-move, helps us give a feel for the machine back to the operators. With this unique combination, the CC 300 sets a new trend for the entire industry."

As process integration and automation increases, the complexity of the production process rises, and this poses increasingly tough challenges for control technology. The more intuitive and convenient the control unit is, the more safely and efficiently the production system can work. "The control unit has become an important factor of efficiency in integrated and automated system solutions," Dr Neumann says.

Functions – customised and focused

The new CC 300 control unit allows injection moulding machines and manufacturing cells to be controlled according to tasks such as mould changing, or according to functions such as injecting. The information displayed concentrates on the essential.

The new central operating element (control wheel), which provides millimetre-precise accuracy and speed-sensitive control for movements, is called 'e-move'. The clearly defined functions increase safety levels when sensitive movements are made and significantly reduce the risk of operation error. Simply pressing the intelligent operation button is enough to start the machine and to initiate various movement sequences. Gerhard Dimmler, product research and development head at Engel Austria says, "With 'e-move' we are able to fulfil our customers' wish of making it easier and easier to control injection moulding processes without reducing efficiency or safety levels. It has taken 'one-button-control' for injection moulding machines from being a vision to being reality."

The complete integration of Engel viper linear robots and Engel easix multi-axis robots, which Engel will continue to use with all the products in its new generation of control units, also contributes to this. The entire manufacturing cell can be controlled and monitored centrally from the injection moulding machine's control panel. The CC 300 therefore offers efficiency-optimised interaction between the injection moulding machine and automation, reduces cycle times, and by doing this plays a crucial role in maximising competitiveness.

Ergonomics – individualised with higher safety levels

Seeing, feeling and adapting are key factors as far as ergonomic improvements are concerned on the new CC 300 controller. The new 21-inch full HD display, for example, is easier to read and also offers simpler and user-friendlier navigation.

The information and layout of the different screen pages can be adapted to suit the user's individual needs, and touch elements can be assigned different functions. The control panel automatically switches to the position which is best ergonomically suited for the individual operator when they log on.

Latest technologies – robust, fast and user-friendly

Thanks to capacitive touch technologies, the new CC 300 machine control unit can be operated as easily as a smartphone and is also just as quick to respond. Safety glass gives it a surface which remains robust and insensitive to dirt even in unfavourable environments.

The increasing degree of process integration and automation is constantly presenting plastics processors with new challenges. Acquiring ENGEL's new CC 300 control unit will ensure that they are as well equipped as possible for the future and able to program, activate and monitor complex processes easily with outstanding precision and safety.

Engel viper – the powerful linear robot

Maximum stability, impressive dynamics and maximum user friendliness – the new ENGEL viper combines all of these things with ease. It saves weight thanks to its innovative design using laser-welded steel sections and convinces users with a substantially higher load-bearing capacity.

More efficiency thanks to intelligence

Thanks to clever software, the Viper Robot from ENGEL automatically reduces structure-borne vibration, even with longer axis dimensions, and optimises its movements and dynamic values to achieve better efficiency.

The impressive results: ultra-fast cycle times and maximum productivity accompanied by low energy consumption.

Light but powerful

Maximum stability and dynamic values despite a low weight and substantially improved manipulation weight. The innovative design using laser-welded steel sections makes this possible. Your economic advantage: smaller robots and lower cost of investment for high manipulation weights.

More Intelligence – More efficient

Clever software ensures faster cycle times, improved productivity and a longer working life due to gentler handling of mechanical components:

- 'Mass identification' identifies the manipulated mass 'online', adapts the dynamic values to match, and thus ensures optimised acceleration
- 'Vibration control' reduces structure-borne vibration, even for longer axis dimensions
- 'Efficiency control' optimises robot movements for maximum productivity while consuming very little energy.

Engel viper robot range

The Engel viper has met the mark. Its high performance capability and operating efficiencies have won over customers who would still have purchased it even without a new Engel machine.

Engel viper 6: 6 kg nominal load-bearing capacity
Engel viper 12: 12 kg nominal load-bearing capacity
Engel viper 20: 20 kg nominal load-bearing capacity
Engel viper 40: 40 kg nominal load-bearing capacity
Engel viper 60: 60 kg nominal load-bearing capacity
Engel viper 90: 90 kg nominal load-bearing capacity
Engel viper 120: 120 kg nominal load-bearing capacity

The Engel viper robots can be supplied on Engel injection moulding machines, or viper can be supplied for injection moulding machines from other manufacturers.

Plastics machinery supplier, Techspan Group, have represented Engel in New Zealand since 1979. Techspan is still a 100 percent New Zealand-owned and operated family business.

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