## Process integration summit
Welding in the mould reduces the costs of the component

## Revolution in lightweight construction
ENGEL organomelt fit for serial production

## Precision work for cars
Space-saving automation at Johnson Controls in Grefrath

## Cleanroom as a decisive factor
V.A.R.I. relies on maximum precision and efficiency

---

**Ready for action in just a few seconds**

ENGEL famox automatic mould change system sparks productivity boost
Servohydraulic triumph

Anyone whose investment decisions were driven by the energy efficiency of the injection moulding machine had no alternative but to purchase a fully-electric machine – up until recently. This has now changed. Fully-hydraulic machines with servohydraulics realise energy saving potentials that typically compare well with those of fully-electric machines. In other words, the choice of drive technology is no longer driven by the energy saving potential, but by the application. Fully-electric machines thus continue to replace hydraulic machines in high-performance or fast running applications, whereas servohydraulics help to provide a future-oriented answer to energy efficiency questions for companies that produce a versatile range of moulded parts.

Further, as increasing affluence and limited resources necessitate a sustainable approach to resource management, energy is bound to increasingly dominate public discussion in the future. ENGEL was one of the early adopters in the energy savings field and is a pioneer in the development of energy-saving injection moulding machines. The servohydraulic ENGEL ecodrive is the latest milestone. Comparative energy measurements demonstrate that the expectations of customers who have invested in ecodrive have been fulfilled. At Widek in the Netherlands, for example, energy savings are a huge 50 percent (p. 16). If you consider the fact that energy accounts for five to ten percent of the total production costs of a moulded part, ecodrive clearly offers impressive profitability. Our sales figures confirm this. Every other tie-bar-less machine, and every other dual-platen machine from our production facilities worldwide is delivered with servohydraulics in place. The investment in ENGEL ecodrive quickly pays for itself, and is thus an important building block in gearing production for the future.
Lightweight construction, no warpage: MuCell Seminar in Triptis

Representatives of more than 90 plastics processing companies came together late in March in the technical centre of RKT Formentbau und Kunststofftechnik, a company based in the German town of Triptis. They were there to learn about the possibilities and opportunities offered by MuCell foam injection moulding. The event was organised by ENGEL Nuremberg together with its business partners RKT and Texel. The growing significance of MuCell physical foaming is based on two factors: the increasing trend towards lightweight construction and the minimal distortion of products manufactured under the MuCell process. Following on from two fully attended seminars on the subject of MuCell (the first of which was hosted in Austria last November), ENGEL will arrange a new series of seminars in the autumn of 2011.

„MuCell physical foaming is becoming vastly more significant. “

Claus Wilde, sales engineer, ENGEL Germany

Smart Ideas: Teletronics Days in Mexico

In line with the slogan, „Smart ideas for Smart Phones & More“ in May ENGEL invited plastics manufacturers in the telecommunications and consumer electronics industries to Mexico for its Teletronics Days. At its subsidiary in Queretaro ENGEL and its technology partner Roctool demonstrated the efficient production of thin-walled components with a high-quality finish. „Mexico is a key market for the telecommunications and consumer electronics industries,“ stresses Heinz Rasinger, Head of the Teletronics Business Unit at ENGEL in Schwaebisch Gmuend/Austria. „The demand is predominantly for system solutions for displays together with thin-wall applications for high-quality finishes. “

Focus on Energy Efficiency: Chinaplas 2011 in Guangzhou

At Chinaplas 2011, ENGEL presented six system solutions that promise highly cost-effective and energy-efficient production, enhanced precision and greater productivity – the three major themes of the trade fair. The ENGEL duo 5550T/300, for example – fitted with an ENGEL servohydraulic ecodrive – produced engine covers in a Mecamelt mould. With an ecodrive, the speed of the machine is directly linked to engine speed, which means zero energy is consumed during downtimes (such as cooling phases). According to the application and type, machines equipped with ENGEL ecodrives consume up to 70 percent less energy than similar conventional hydraulic machines. Moreover, an ecodrive cuts consumption of coolant in oil coolers to a minimum (and actually to zero in many cases). Oil temperature is one indicator of the energy efficiency of a machine. The ENGEL duo machine was presented in Shanghai as a complete manufacturing cell, including automation. The engine covers were removed from the mould by an ENGEL viper 40 linear robot.

The large-scale machine on show at the stand was from the ENGEL production plant in Shanghai, the capacity of which is set to double this year to 200 large-scale machines annually. The expansion is a matter of urgency to meet rising demand from China as well as Southeast Asia and India.

„Chinaplas 2011 was a record event for us. Never before we recorded more visitors at our stand than this year. “

Gero Wilmeroth, President Sales and Service at ENGEL Machinery (Shanghai) Co. Ltd.

Complex hollow parts in a single step: FIP solution plastique in Lyon

"Competitive pressure on injection moulders in western Europe is continuing to increase," says Philippe Sterna, Managing Director of ENGEL France, "this is reflected in growing demand for highly integrated and automated system solutions, which we provide from a single source in collaboration with brand-name partners.

"The best example of this is the manufacturing of complex hollow parts, which was demonstrated live at the trade fair booth on a compact, tie-bar-less ENGEL victory 1050H/900W/200 combi machines as a 3-component application. The Multitube mould system – ENGEL’s partner here is mould maker Pemould from Oyonnax/France – supports the production of hollow components with complex geometries in a single step. This is achieved by means of a multiple stage injection process that integrates picking & placing and over-moulding in a single cycle. Compared with legacy gas injection technology, the MultiTube concept also ensures enhanced quality of the interior surfaces and consistent wall thicknesses."

"The future of medical molding through partnership"

"Going beyond the known"

"The growing significance of MuCell physical foaming is reflected in growing demand for highly integrated and automated system solutions, which we provide from a single source in collaboration with brand-name partners."

"Competitive pressure on injection moulders in western Europe is continuing to increase," says Philippe Sterna, Managing Director of ENGEL France, "this is reflected in growing demand for highly integrated and automated system solutions, which we provide from a single source in collaboration with brand-name partners."

"The best example of this is the manufacturing of complex hollow parts, which was demonstrated live at the trade fair booth on a compact, tie-bar-less ENGEL victory 1050H/900W/200 combi machines as a 3-component application. The Multitube mould system – ENGEL’s partner here is mould maker Pemould from Oyonnax/France – supports the production of hollow components with complex geometries in a single step. This is achieved by means of a multiple stage injection process that integrates picking & placing and over-moulding in a single cycle. Compared with legacy gas injection technology, the MultiTube concept also ensures enhanced quality of the interior surfaces and consistent wall thicknesses."

"The future of medical molding through partnership"
Saving costs with tie-bar-less machines: ENGEL at Interplastica in Moskau

Pipe fittings were produced by a fully electrical and automatic process on an ENGEL e-victory 740/160 at ENGEL’s booth during the Interplastica. The manufacture of plastic pipe fittings places special demands on production engineering. It calls for large moulds with projecting cores, requiring a relatively low clamping force of the injection moulding machine. Hardly any other machine on the market meets this requirement as perfectly as the ENGEL victory or its electric version ENGEL e-victory, whose clamping units function without tie-bars. The tie-bar-less machine concept enables full utilisation of the mould fixing platens and maximum space for moulds. This means that large moulds can be mounted on relatively small machines, saving not only space, but also costs for acquisition and operation.

In Russia the lion’s share of all orders, about 90 percent, are ENGEL victory machines. Besides fittings production, they are also used in the automotive industry, where high demands are placed on reliability, and in the toy industry, where moulds must be frequently changed.

„Machines of the ENGEL victory series continue to be a huge success in Russia.“

Olaf Kassek, Manager of OOO ENGEL in Moscow, Russia

Introducing elastomer processing: Plastpol in Kielce

At the end of May, ENGEL showed how innovative injection moulding technology can be combined with maximum efficiency and cost-effectiveness at the Plastpol trade fair in the Polish city of Kielce. A special emphasis was placed on elastomer processing, a brand new topic at Plastpol. Whilst the trade fair was Hiebrecht aimed exclusively at thermoplastic and duroplast processors, the target group was broadened this year.

On its stand, ENGEL produced pens using an ENGEL elast 750/250 V 5 vertical machine. Two pen cases and two caps were produced in a single cycle from a 4+4-cavity mould from ORP Stampi; they were moulded using type HTV 500/60G hard silicone from PMG.

Fit for a new efficiency league: ENGEL at the Medtec Europe

With 25 percent more output and 65 percent less energy consumption, ENGEL medical is setting new standards for Petri dish production. A fully electric, automated ENGEL e-motion 1340/290 T put this to the proof at the Medtec Europe in March in Stuttgart/Germany. For the first time ever, ENGEL was demonstrating its excellent system competence in medical technology at the Medtec fair. Together with four partners, also all leaders in their fields, ENGEL has developed a complete system solution for the fully automated production and packaging of these demanding laboratory products. This high-performance system was already premiered at K 2010. The cell produces eight upper sections and eight bases for petri dishes from polystyrene in an 8+8-cavity Plastisud mould in a cycle time of 3.7 seconds; the cycle times for conventional machine technology are 4.6 seconds. The entire production area of the fair exhibit, including the assembly and packaging, was presented as a clean room. In addition to the exceptionally short cycle time, the high-performance production cell featured extremely low energy consumption.

„Given the trend towards high-cavitation moulds with very short cycle times, one priority in the development of fully electric machines is greater clamping force."

Christoph Löhna, head of ENGEL’s medical business unit

Think Thin:
ENGEL Specialist Symposium in Shanghai

"Think Thin" – this was the motto of the specialist symposium in Shanghai to which ENGEL invited decision makers from the laptop industry and their suppliers. In March this year, ENGEL demonstrated, in cooperation with partners, how additional laptop lid size and weight savings can be achieved. The new technology developed by ENGEL was demonstrated live on an ENGEL duo machine with a clamping force of 500 tonnes. The machine was equipped with a compression package and in-mould labelling. The label was insert-placed and the finished parts were taken off by an ENGEL viper 40 type robot. Besides decision makers from the laptop industry, representatives of other industries that require decorated thin-walled parts, cutouts with quality surfaces attended the event.

"In future, our injection moulding machines will be capable of producing laptop lids with wall thicknesses of just about one millimetre."

Heinz Rangier, Head of the ENGEL teletronics business unit

Events 2011:
MSV, Brno/Czech Republic, 3rd-7th October
TIB, Bucharest/Romania, 5th-9th October
Fakuma, Friedrichshafen/Germany, 18th-22nd October
Plast Eurasia, Istanbul/Turkey, 27th-30th October
Brau Beviale, Nuremberg/Germany, 9th-11th November
Equiplast, Barcelona/Spain, 14th-18th November
Plastics & Rubber, Jakarta/Indonesia, 16th-19th November
Saudiplast, Riad/Saudi Arabia, 21st-24th November
Plastex, Cairo/Egypt, 24th-27th November

Preview of 2012:
ENGEL Symposium, Austria, 12th-14th June

Clearroom solution:
EUROSTAMP 2011 in Parma

Highest precision and efficiency took centre stage at the trade fair stand of ENGEL Italia at EUROSTAMP in March in Parma/Italy. The injection moulding machine builder and automation expert gave live demonstrators of the manufacture of needle holders for syringes at the stand of its central Italian representative Leonardi SPA. The clearroom version of an ENGEL e-max 200/100 injection moulding machine was used for the purpose. With its all-electric drive technology and highly dynamic servo motors, the ENGEL e-max machine series combines the highest degree of precision with maximum efficiency. Due to its extremely compact design it has a small footprint, further increasing cost efficiency in the cleanroom.
The new process, its potential and opportunities were discussed by Georg Steinbichler, Head of Research and Development Technologies at ENGEL AUSTRIA, Franz Füreder, Head of ENGEL Business Unit Automotive, Michael Fischer, ENGEL Sales Manager Technologies, and Karl-Heinz Knab, Sales at Hummel-Formen.de. Within the cooperation KVT Bielefeld, Germany, is responsible for welding technology and holds a patent for hot gas welding in a protective atmosphere to ensure a particle-free and highly stable weld (www.kvt-bielefeld.de). ENGEL participates as an injection moulding machine manufacturer and automation expert. It also developed the software for controlling the integrated process flow.

Superior product quality at a lower cost

The trend towards combination of various production stages into an integral process is advancing. ENGEL joinmelt enables components to be joined for the first time directly in the injection mould. Besides a reduction in investments and the cost of component parts, the principal incitement for process developers is an increase in component quality.

ENGL joinmelt takes process integration to new heights. How does the process work? Steinbichler: In the ENGEL joinmelt process the upper and lower parts of a component are injected simultaneously into a common mould. When the mould is opened, one part remains in the left and the other part in the right mould half. Now the movable half of the mould is shifted until the upper and lower parts are aligned for joining. A heating element is then positioned between them. The edges of the component halves are heated and joined together by closing the mould.

Doesn’t that prolong the process? Füreder: We produced prototype parts with the ENGEL joinmelt and determined that we achieve approximately the same cycle time as for the injection moulding process without integral joining. That is possible because we save the time for welding during cooling. When the mould opens for the welding process, the two component halves still have a temperature of around 100°C.

Fischer: Whether or not the cycle time is prolonged by integration of the welding process depends on the respective component geometry and size, as well as the wall thickness and materials used.

Steinbichler: The total component manufacturing time is much more important than the cycle time alone. In the conventional process the parts are injection moulded, then stockpiled until they can be welded together on another machine. The ENGEL joinmelt completely eliminates this temporary stockpiling, handling of semi-finished products and a second work stage, thus accelerating the manufacturing process. Furthermore, the integral machine saves investment costs compared to two separate machines and requires hardly more space than the injection moulding machine without welding function.

ENGEL joinmelt also produces superior component quality. How can this be explained? Knab: If the two component halves are first injection moulded and subsequently joined together in the conventional manner, this usually requires compromises. The conventional vibration welding results in burns along the welding seam, where minute particles, so-called flashes, form. When these are removed, the functional parts – for example the valve tapetts in the combustion engine – may be damaged. Although hot gas welding creates clean and homogeneous weld-seams, this process requires absolutely coplanar joining surfaces which injection-moulded components rarely have. Usually the components warp while cooling and taking-off. This dilemma finally led to the idea of welding the hot component parts together while they are still in the mould. For as long as the moulded parts are hot, no tension can occur and there will be no warping. Furthermore, no humidity is absorbed in the short time. This guarantees absolutely coplanar surfaces which can be cleanly joined. It is also important that the injection moulding machine can be controlled with a high degree of precision in order to achieve even surface pressure.

Füreder: Incidentally, the high quality of the weld-seam results in a further savings effect. With our prototype parts we were able to reduce material consumption, because the weldseam was much thinner than normal. Furthermore, hot gas welding ensures a high degree of process stability and reproducibility, ensuring shorter production start-up times and optimisation, and reducing the amount of rejects in running production operations.

To which components is the ENGEL joinmelt best suited? Knab: The process is predestined for complex, three-dimensional structures such as suction pipes, exhaust gas manifolds or oil reservoirs which were conventionally manufactured in a multi-stage process. This opens up a broad new range of possibilities for designers and product engineers. For example, internal risks for reinforcing a component can be welded on simultaneously, reducing tensile and shearing forces and increasing their strength, e.g. pressure vessels.

Fischer: Because ENGEL joinmelt creates an extremely homogeneous, clean weldseam, the resulting joins have a high strength. Generally speaking, the freedom from particles on the inside of hollow plastic bodies gains in significance with increasing complexity of the component geometry. The best results are obtained in the welding process with filled polyamides and other high-tech materials, even with materials considered difficult to weld, such as PBT, POM, PPO and PPS. Füreder: The welding process is also suitable for light-coloured visible parts in which discolouring is to be avoided, and generally for products which must satisfy high cleanliness criteria. Because with hot gas welding the plasticisation energy is introduced contactless via an inert gas – usually nitrogen – the melt cannot oxidise.
New **horizons** for lightweight construction

The new Audi A8 front end weighs much less than its predecessors. Innovative fibre-reinforced composites, or so-called organic sheets, make a crucial contribution in this respect. New process technologies are being developed so that this new dimension in lightweight construction no longer belongs exclusively to the high price segment.

Lightweight construction is not only a question of the material. It depends far more on the interaction between the material, design and manufacturing process. The thinner the walls, the lighter the component. Reinforcing materials are used to achieve better mechanical properties. Primarily long and short fibres were hitherto used for the reinforcement of thermoplastics where mechanical properties improve with increasing fibre content and length. According to the orientation of the fibres, thermoplastics reinforced with short fibres exhibit anisotropic material behaviour, which among other things depends on the filling of the cavity. Long-fibre reinforced thermoplastics achieve better mechanical properties. However, the final properties of the component are also determined by the orientation of the fibres.

**Long-fibre reinforced thermoplastics as a metal substitute**

Long fibres with a length which lies within the dimensions of the component can be distributed in such a way that they only fulfil the required reinforcing function in the direction of the applied load. This enables the fibre content and therefore the density of the component to be reduced. The properties of a component can be improved whilst maintaining the same fibre content. Due to their low viscosity, long fibres are usually bound in a thermosetting plastic matrix, which incurs some disadvantages. The applications for long fibres are limited by long cycle times, lack of processing flexibility, limited shelf-life of previously cross-linked, semi-finished products and inadequate existing automation technologies. To date long-fibre reinforced materials are mainly used in aerospace and other high-end segments.

Plastic/metal hybrid structures are often used for components subject to particularly high mechanical stress. These are superior to sheet metal components in terms of weight reduction potential and energy absorption capacity. Plastic/metal hybrid components are ideally suited for use as crash elements, which also constitute the support structure. However, even these components are not the be-all and end-all of car manufacturing. In the event of temperature fluctuations the very different coefficient of thermal expansion of the metal and polymeric materials leads to stresses at the joints. In the worst case, components may fail. Hybrid structures made completely of thermoplastic do not suffer from these disadvantages. Long-fibre reinforced plastic components are potential substitutes for metal parts – an important driver for developing new material combinations and injection moulding technologies which overcome the disadvantages of processing thermosetting fibre composites.

The injection moulding of semi-finished long fibre thermoplastic components, the so-called organic sheet promises the lightest components, shortest cycle times, highest efficiency and broadest range of applications. They have an almost unlimited shelf-life, are formable and at lower density they exhibit a rigidity and strength comparable to conventional fibre composites. Particular mention must be made of their good impact properties, which make them suitable for use in automotive applications. The term organic sheet stems from the organic matrix – mostly polyamide (PA), polypropylene (PP), polypropylene sulphide (PPS) or thermoplastic polyurethane (TPU) – and its use as a substitute for metal sheet.

**Six process steps in one**

A fully automated process chain for cost-effective production of large volumes with high productivity and reproducible quality was hitherto unavailable. The first solution was presented by the injection moulding machine builder and automation specialist ENGEL at the K-Fair in October 2010. On this occasion the fully automated production of a steering column bracket was demonstrated.

The steering column bracket consists of a flat, high-strength shaping component, the organic sheet and injection moulded ribbing. The basis for the development of the manufacturing cell is so-called in-mould forming (IMF), a process chain developed by LKT (Institute of Polymer Technology) in Erlangen/Germany for processing thermoplastic fibre composite semi-finished products into components with reinforcing structures. The manufacturing cell exhibited at the K-2010 integrates six process steps: transfer of the organic sheets from a linear to a multi-axial robot, heating of the organic sheet, pre-forming in two dimensions, forming or shaping by closing the mould, back-injection and cutting of component edges after injection moulding. Hybrid fully thermoplastic load-bearing structural parts were manufactured at the K-Fair by a fully automated process with a high level of productivity. The cycle time was under 60 seconds. ENGEL calls this technology “organomelt”.

Organic sheets contribute not only to a weight reduction at the front end of the new Audi A8: the material-specific use of organic sheets in conjunction with the back injection of stiffening and functional structures promises weight savings of up to 50% compared to conventional solutions.
ENGEL famox: automatic mould changer

Ready to go in only a few seconds

The shorter the set-up time, the higher the productivity. With the aim of further increasing the level of efficiency at its customers’ plants, ENGEL has extended its product portfolio to include an automatic mould changing system. ENGEL famox – fast mould exchange – enables mould changing in less than a minute.

Production lifecycles are shortened and a larger range of models is available. A further trend is becoming evident, particularly in the automotive industry: radical reductions in inventories. For injection moulding production this means ever smaller batches and consequently more frequent mould changing processes. A recent survey by ENGEL of the current market situation has shown that the number of mould changes is expected to almost double in the next five years from an average of 0.9 per day to 1.7. In an effort to avoid a negative impact on productivity or incur an increase in component costs, automatic mould changing systems are gaining significantly in importance.

Continuous operating philosophy

A uniform operating philosophy, simpler data transfer and a comprehensive security concept are among the advantages of procuring machine and automation from one source. In the case of ENGEL, this strategy now also includes mould changing. ENGEL famox is equipped with control logic, visualisation and ergonomics of the CC 200 control unit of ENGEL injection moulding machines. All mould and machine parameters can be transferred from the machine to the mould changing system without external interfaces. The diagram of the mould changing system can be displayed either on the table itself or on the machine. The animated screen page gives the user a fast overview of the current status of the system and enables the mould change to be started with only a few settings. Besides the continuous operating philosophy, two further factors contribute to the high mould changing speeds of the ENGEL famox: the integral mould pre-heating station and standardised multi-coupling for media lines.

Direct drive for high availability

ENGEL stands for high availability, not only in respect of injection moulding machines and robots, but also mould changing. Whereas conventional mould changing systems work with chain drives, the ENGEL famox scores points with direct roller drives. Because each roller has its own electric motor, the system proves to be extremely robust in operation. The automatic mould changing system will be available in three sizes. The first will be the ENGEL famox 25 for mould weighing up to 25 tonnes. A version for smaller and larger machines or moulds is to follow.
True greatness in a small package

ENGEL flomo is one of the smallest manually configurable temperature control and water distribution devices with electronic monitoring on the market, and this is precisely what makes it so impressive. The distributor can be mounted in close proximity to the mould, thus minimising heat loss thanks to short hose runs.

The ENGEL flomo has been injection moulding machine manufacturer ENGEL add a temperature control and water distribution unit to its manufacturing programme since K 2010. The system, with its name based on flow monitoring, is suitable for permanent monitoring of all cooling and temperature control circuits on injection moulding machines and moulds. As it works electronically, it is an extremely economic alternative to legacy, maintenance-intensive cooling water batteries with inspection glasses.

Water is fed in from the water supply through a central inlet or from a temperature control device on the manifold, where the feed pressure and temperature are measured. The temperature measurement serves to check that the temperature control device and/or cooling system are working properly. The flow lines are equipped with shut-off valves to allow individual circuits to be deactivated as needed. The flow rate and temperature of the water exiting the mould directly are measured in the system’s return channels. The flow rates on any circuit can be set manually using the fine-adjustment regulating valves.

The pressure, temperature and flow rate signals are transferred via an interface to the injection moulding machine’s control unit where they are displayed graphically and numerically, evaluated and stored for complete documentation. ENGEL flomo is integrated with the CC 200 control unit on the ENGEL injection moulding machine.

Double-lead screw

Higher throughput with the greatest of ease

Advances in mould and temperature control technology have resulted in a continuous reduction in cooling times and significantly higher throughput in conjunction with parallel movements in fully electric and hybrid machines. The required melting capacities are often not achieved with conventional three-zone screws. The consequences range from inadequate melt or part quality to increased wear on barrel, screw and non-return valve. A double-lead screw developed by ENGEL AUSTRIA achieves this performance boost.

With its flat intake zone the double-lead screw ensures a high level of shearing energy, so that a high degree of melting has already occurred prior to compression. This prevents the formation of a "solid wedge" which would result in deflection of the screw and increased wear. In addition, a second fin reduces deflection from the centre of the intake zone. This is situated directly opposite the first and ensures a symmetrical pressure profile during plasticising. To avoid sprinkling problems, the material is initially delivered through a single lead. In this way, significantly higher throughputs can be achieved compared to the standard screw, particularly in applications which were hitherto considered problematic, such as the manufacture of technical articles of PP, thin-walled technical parts of PA or POM components. Compared to conventional plastifying screws, significantly more cost-effective and technically optimised solutions can be realised with double-lead screws in the processing of free-flowing plastics. Depending on the plastic, cycle time reductions of approx. 30 percent can be achieved with the same screw diameter. The double-lead screw is available in standard lengths (L/D 20) with diameters of 35 to 80mm. Three materials designs can be supplied: S1 for unreinforced plastics, S8 for corrosive and reinforced plastics with a fibre content of up to 30 percent and S8 CrN for medical applications and plastics with corrosive additives, such as flame inhibitors.
16 million inhabitants but 20 million bicycles. There is probably no other nation in the world that loves its bicycles and cycling as much as the Dutch. And probably no other nation that invests more heavily in new technologies and accessories for their bikes. At the heart of this dynamic market, Widek develops and produces accessories for leading cycle brands worldwide. To continue expanding its competitive advantage, the company relies on its innovative strength and efficient, sustainable production technology.

“We don’t get involved in price cutting, but rely on innovative specialist products, on quality and our technology competency”, emphasises Wim de Kwant, the CTO with Widek in Krimpen aan den IJssel. The family-managed business is very often the first to launch technical innovations on the market. The latest example is the bicycle grip with an integrated bell. The metal housing of the bell fits around the handlebar; the bell itself is actuated by pressing a rotating plastic ring with your thumb.

Both the sleeve and the end cap of the cycle handle are manufactured in two-component injection moulding on an ENGEL victory 125 combi. The three-cavity mould measures 800 by 800 millimetres, but it still fits on an injection moulding machine with a clamping force of 130 tonnes. All this is possible thanks to the tie-bar-less design of the ENGEL victory machines. Without tie-bar-less technology we would need to buy bigger machines, although our applications don’t need the higher clamping forces.”

“We noted that many children were too big for the popular models”, says de Kwant. “The new Qibbel brand offers the largest seat surface on the market. Bicycle turnover will continue to increase; this is one thing that Wim de Kwant is sure of. “Riding a bicycle is the most sustainable form of mobility and is thus absolutely in line with current trends.” As one of the leading companies in this green field of business, it is a matter of course for de Kwant to continually optimise manufacturing processes taking the aspect of sustainability into account. One thing that he focuses on is the energy efficiency of the injection moulding machines. Because of this, he ordered the first victory machine with the servohydraulic ecodrive from ENGEL at Fakuma 2009; this was a 220 tonnes machine which is now used for manufacturing the foot shells for children’s seats. “The concept of the machine only using energy when it really needs it is something that convinced me right from the outset”, says de Kwant.

ENGEL ecodrive on the ENGEL victory machines consists of a servomotor with fixed displacement pump, instead of a permanently running asynchronous motor with a variable capacity pump. This approach improves energy efficiency by reducing the energy loss that occurs in legacy, hydraulic machines. During standstill times, cooling for example, the machine does not consume any power. The ecograph analysis tool makes this transparent by identifying the energy consumption of the individual functions. “We were surprised how much energy clamping force build-up consumes on its own”, de Kwant reports.

At Widek, ecodrive saves 50% energy compared with a legacy, hydraulic injection moulding machine. On top of this, ecodrive can do without oil cooling in this application. Typically, the portion of supplied energy that is not applied as movement energy for individual machine movements is transformed into heat and then dissipated into the hydraulic oil. The oil temperature thus becomes an indicator of the energy efficiency of the machine. “The oil temperature of the machines equipped with ecodrive never rises above 25 °C at any time”, says de Kwant. This fact saves Widek a lot of money, and not only thanks to reduced energy and cooling water consumption. The construction work for extending the company’s injection moulding production will be commencing shortly. Equipment for oil cooling was left out as early as the planning phase. After all, the machines have already been ordered: tie-bar-less ENGEL victory machines with ecodrive.
Made to measure

At Johnson Controls in the German town of Grefrath, floor space of 15 by 18 metres was enough to accommodate two 3,000-ton injection moulding machines, four jointed-arm robots, one mould change system, a pair of quality assurance stations and two conveyor belts. This was achieved by making use of the ceiling height – and by closely incorporating ENGEL into the planning process as the supplier from day one. The aim was to deliver as much as possible from a single source.

"It quickly became clear to us on this project that we could only complete the task by using the height of the room as well as the available floor space", recalls Markus Ingendae, launch manager at Johnson Controls Interiors. Ingendae and his team developed a totally new injection moulding production process for dashboard carriers in the Daimler brand’s volume models. Until a few years ago, presses provided the only way to process long glass-fibre reinforced thermoplastics. The production hall of the Grefrath-based automotive supplier contained two pressing plants until recently; now one of these has made way for injection moulding production. ENGEL provided full automation along with an ENGEL duo injection moulding machine; it also integrated another large-scale machine already on the site into the overall concept.

Compact design, economical operation

The two injection moulding machines are now situated facing one another, an arrangement that highlights the compact construction of the ENGEL duo machine. Thanks to its two-platen compact clamping unit, the ENGEL machine is significantly shorter than similar large-scale machines from other companies, but that was not the only reason for the decision to purchase the ENGEL duo series were also important factors. “Power is transmitted to the moving platen at four points, which improves the functioning of the core-pulls”, said Andreas Driessen, process engineer at Johnson Controls Interiors.

Given the limited floor space of the hall, the automation was moved up a level onto a stage, thereby taking advantage of a ceiling height of seven metres. Inserts and prefabricated parts are handled from above by four ABB jointed-arm robots (two per machine). The total capacity of the two machines is 15,000 dashboard carriers per week.

Fewer interfaces, faster series production

Just on seven months elapsed between the initial planning discussions and the first test runs; foundations also had to be laid because there had previously been a cellar beneath the hall. Ingendae and his team had developed the basic concept for the new production complex in advance, but quickly brought ENGEL on board to perform the fine-tuning and minimise the number of interfaces. The high level of systems expertise possessed by the Austrian machine manufacturer (which has a German subsidiary in Hagen, not far from Grefrath) was exactly what was needed. The Johnson Controls team travelled to St. Valentin in Austria for initial discussions at the large scale machine plant; all subsequent dealings took place on site in Germany. “Personal contact has to include the design engineers – that’s very important to us”, emphasised Ingendae. “We arranged a lot of things through unofficial channels, without upsetting anyone. This was the only way to manage such a big project in such a short time. It often comes down to a question of pragmatism on both sides.” Udo Reitmüller, sales engineer at ENGEL Deutschland in Hagen, reveals that, “The suppliers are all connected on a project of this kind, so if a delay occurs at any point, that will capsize the whole schedule. But that didn’t happen in this case – the interaction between all of those involved was highly professional. To avoid waiting, we simply brought other tasks forward.

“’The fitness of our suppliers is critical. Given the limited timeframe available, we demanded speed, flexibility and pragmatism.’

Markus Ingendae, Johnson Controls Interiors.

‘The team from Johnson Controls was supported in the test runs by Reinmund Schlepp, head of software at ENGEL Automatisierungstechnik (Automation Technology) in Hagen/Germany, who was on the premises in Grefrath for a total of six weeks. He spent most of that time attending to the robots on the stage above the injection moulding machines, precisely coordinating every movement according to the requirements of the two machines, moulds and components. Jörg Klinkhammer, senior launch manager at Johnson Controls Interiors, agrees that, ‘The art is to synchronise the process in such a way that the quality of components is consistently high across the production chain. We gave everything we could to achieve that.’

Johnson Controls manufactures 15,000 dashboard holders per week on the new machine – a previous model is shown here.

Udo Reitmüller from ENGEL Deutschland (top right) with his project partners from Johnson Controls: Andreas Driessen (top left), Jörg Klinkhammer (down left) and Markus Ingendae (down right).
Eldor has stuck to its guns when it comes to coils. The product scope includes vehicle power supply and distribution components, for example ignition systems, of which the works produces no less than 22 million units a year. The ignition systems comprise some 35 individual parts. Depending on the vehicle type, this includes four to five plastic components, which Eldor manufactures itself using injection moulding. "These parts are the key components," Forte reveals. "They are decisive for the quality of our products. This explains why injection moulding is one of our key competencies."

The latest investment in Turkey underlines this message. 65 injection moulding machines went into service at the beginning of April, mainly tie-bar-less ENGEL victory machines, but also including some vertical ENGEL insert machines. Clamping forces are between 80 and 120 tonnes. Moulds are manufactured with high precision and its own injection moulding. "The company today produces some 600 different moulded parts. The production equipment has to match the pace of this dynamic environment. A second advantage offered by tie-bar-less technology is equally important to Luca Forte as short mould mounting times: freedom of design for the mould maker. "We optimise our moulds to match the product and not the machine. This means that we have perfect flexibility because we are not forced to compromise due to the machine’s design."

Worldwide network
In the late 1990s, Pasquale Forte founded the Izmir facility on Turkey’s Mediterranean coast. From here the group of companies, which has its headquarters in Northern Italy, supplies electronics components to the international automobile and motorcycle industry. A Fast-Moving Line of Business. Flexibility is one of the most important requirements.

In the automotive industry product lifecycles are becoming shorter all the time", says Luca Forte, Head of Procurement with Eldor Corporation S.p.A. in Orsenigo, 50 kilometres north of Milan. "And we need to adapt to this continually increasing speed”. His father, Pasquale Forte, President of the group of companies today, founded Eldor in 1972, and the nearly 40-year company history goes to prove that adaptability is one of the entrepreneurial family’s greatest virtues. The product portfolio has changed completely in this time. Where the company originally manufactured coils and other components for the consumer electronics industry, especially for TV production, it now focuses entirely on the automotive industry. Customers include major players in the industry such as VW, Audi and Nissan, Porsche, Ferrari and Lamborghini, Proton and Ducati. But Eldor has stuck to its guns when it comes to coils. The product scope includes vehicle power supply and distribution components, for example ignition systems, of which the works produces no less than 22 million units a year. The ignition systems comprise some 35 individual parts. Depending on the vehicle type, this includes four to five plastic components, which Eldor manufactures itself using injection moulding. "These parts are the key components," Forte reveals. "They are decisive for the quality of our products. This explains why injection moulding is one of our key competencies."

The latest investment in Turkey underlines this message. 65 injection moulding machines went into service at the beginning of April, mainly tie-bar-less ENGEL victory machines, but also including some vertical ENGEL insert machines. Clamping forces are between 80 and 120 tonnes. Moulds are manufactured with high precision and its own injection moulding. "The company today produces some 600 different moulded parts. The production equipment has to match the pace of this dynamic environment. A second advantage offered by tie-bar-less technology is equally important to Luca Forte as short mould mounting times: freedom of design for the mould maker. "We optimise our moulds to match the product and not the machine. This means that we have perfect flexibility because we are not forced to compromise due to the machine’s design."

Fast Mould Changes, More Freedom of Design
In Italy, Eldor is one of ENGEL’s oldest customers, and one of the earliest adopters of the tie-bar-less technology, which ENGEL developed over 20 years ago. Ever since, Eldor has remained true to this technology, thus saving valuable production time in the past and today. “Even mounting and dismounting bulky moulds is a trouble-free process”, says Forte. “This makes our production highly efficient and puts us in a position to deploy the machines in a flexible way.”

Each automobile brand has its own ignition system, and each model update or innovation in engine technology necessitates a new product design. This also applies to the other electronics components in Eldor’s product portfolio, and this means that the company today produces some 600 different moulded parts. The production equipment has to match the pace of this dynamic environment. A second advantage offered by tie-bar-less technology is equally important to Luca Forte as short mould mounting times: freedom of design for the mould maker. "We optimise our moulds to match the product and not the machine. This means that we have perfect flexibility because we are not forced to compromise due to the machine’s design.”

Worldwide network
In the late 1990s, Pasquale Forte founded the Izmir facility on the Turkish Aegean, laying down the foundations for the recently completed new building in the process. The production division, which had previously been located in Italy, has now fully relocated to Turkey. Research and development and the test centre are still located in Orsenigo at the company’s head quarters and are scheduled for expansion. Five injection moulding machines, in various clamping force classes and with various levels of equipment, will be staying in Italy. They will be used to test new product designs and materials, to run-in new moulds and optimise processes before serial production starts in Turkey.

Prior to relocating to Turkey, the company signed a new service agreement with ENGEL, thus ensuring the same levels of service for both countries. Cooperation between Eldor and the ENGEL subsidiary in Vimercite, just 30 km south-east of Orsenigo, has become correspondingly close in the course of the years and is characterised by mutual trust. Pasquale and Luca Forte both appreciate the fact that ENGEL has its own subsidiary in Istanbul.

The automotive industry expects Eldor to be flexible, and Eldor expects the same kind of cooperation from ENGEL. "What we really appreciate about cooperating with ENGEL is that it is big enough to support us worldwide, but has kept the flexibility typical of a family business at the same time. ENGEL individually accommodates our wishes and requirements, and this is the basis that we need to be competitive in the long term. No matter how quickly the world changes, we can keep pace.”
Keeping what is **tried** and **trusted**, and avoiding what is **unnecessary**

Persistently reproducible, precise and stable: these were the most important goals when Sonoco Crellin decided to invest in extending its cuvette production last year. ENGEL supplied two integrated production lines, each comprising an ENGEL e-motion 55 type injection moulding machine, an ENGEL ERC 23 F type linear robot and a tailor-made automation solution for packing the cuvettes. All of this as a turn-key solution with a three-year performance guarantee.

The 4 centimetres high test receptacles for medical diagnostics made of glass clear PMMA have been one of the standing orders that Sonoco Crellin from Berkel en Rodenrijs, Netherlands, has had for many years. The medical technology department of the Sonoco Plastics Division is located just a couple of minutes drive from Rotterdam. The contract manufacturer fulfills a variety of customer requests in an ISO class 8 cleanroom. “Our strength is that we can adapt very quickly to new requirements while maintaining the highest levels of quality”, emphasises Michael Müller, CEO Sonoco Crellin in Berkel en Rodenrijs. “Your taste. Our skills”, is the company’s motto. “Your taste: this refers to our customers’ requirements. Our skills: this means our competency in effectively implementing customer requirements.”

In line with this, large, brand-name medical technology, pharmaceutical and diagnostics corporations are supplied via Berkel en Rodenrijs. One of them is Alfa Wassermann, the customer behind the PMMA cuvettes. For a long time, the global laboratory equipment supplier, who delivers to doctors’ surgeries and hospitals, split its volume of orders among two plastics processors. However, since 2009 Alfa Wassermann has bundled its total volume with Sonoco Crellin. “Of course, our customers wanted long-term delivery assurances from us”, Müller reports. “We had to guarantee that we would be able to reliably deliver larger quantities with a constant level of quality for many years.” This pushed the existing production line to its capacity limits. To be able to except the order, Sonoco invested in extending and modernising its existing production facility. Starting in July last year, production now runs in parallel on two lines which achieve an output of 60 million cuvettes per year.

**Boosting productivity and availability**

It was important for Sonoco Crellin to avoid the need to engineer a completely new production process. “The old plant had its weaknesses, but also its strengths – and we definitely wanted to keep them. Because of this, we looked for a partner who would be able to offer us a state-of-the-art solution based on our existing processes”, Müller says. The major challenge was placed on ENGEL’s automation know-how because this was the area in which Sonoco’s project managers had identified the greatest optimisation potential. “Our old parts handling and packaging system was extremely complex. They were innumerable switches and sensors that all turned out to be error prone, and frequently caused malfunctions”, reports John Ballijns, Engineering Manager with Sonoco Crellin. This led to the wish to keep the new system as simple as possible.

The cuvettes are packed in sleeves. Flat plastic rails, divided in the middle that hold ten cuvettes each on the left and right. The stainless steel feed rails collect the cuvettes after injection moulding and feed them into the plastic rail at a time. During gripping, depositing and pushing of the cuvettes the automation experts had to make sure that the side walls of the cuvettes were not touched at any time. The view windows in this area are designed for visible light and ultraviolet analysis of e.g. blood samples in laboratories. Even the tiniest scratches can falsify the results of spectroscopy.

Sonoco – founded in 1899 in South Carolina, USA – grew into a large corporation by processing paper to create canonical and cylindrical sleeves that quickly revolutionised the packaging industry and are still produced today as packaging for crisps. Today, the group employs more than 18,000 staff in more than 300 facilities, generating an annual turnover of more than 4 billion US dollars. 500 million of this is attributable to the plastics division, which was added as a second line of business more than 50 years ago and has grown continuously ever since. Companies such as Burk, ClearPack, Matrix and APT where acquired and integrated into the Sonoco Plastics division. Sonoco Crellin in Berkel en Rodenrijs not only manufactures products for medical technology, but also packaging, moulds for the industrial production of cheese, coils for fibre-optics and filtration components.

The project team (from left to right): Matthias Hölscher, Project Engineer with ENGEL Automation Technology Germany in Hagen, Bas de Bruin, Account Manager with ENGEL Benelux in Houten/Netherlands, Michael Müller, CEO Sonoco Crellin in Berkel en Rodenrijs/Netherlands, and John Ballijns, Engineering Manager with Sonoco Crellin.
Decisive Cleanroom Competence

When it relocated to larger premises with a new cleanroom for injection moulding operations, V.A.R.I. – a company of the Lindal Group – decided to switch to fully electric presses. These machines have allowed the Italian manufacturer of valves for pharmaceutical applications to comply with the increasingly stringent requirements of its customers while ensuring maximum precision and efficiency.

V.A.R.I. is a leading manufacturer of valves and actuators for pharmaceutical aerosol products. For 25 years, it has produced 20-mm valves for CFC and HFA propellants that have been employed all over the world in a vast range of pharmaceutical applications. The company has an established presence in Europe, as well as in Russia, Asia, South America and Africa, with a market share of over 90% in some of these regions. V.A.R.I. is located in Oggiono in Northern Italy in a modern site covering 6,000 sq.m including 1,500 sq.m devoted to cleanrooms, a laboratory of 300 sq.m, and 900 sq.m of office space. The new factory was built in 2009 from scratch and is equipped with ultramodern positive-pressure cleanrooms featuring HEPA filters for injection moulding processes in a strictly controlled environment. The new cleanroom includes fully electric injection moulding machines with a clamping force of 100 tonnes delivered by ENGEL, each with a HEPA laminar flow box above the clamping unit. All servoelectric drives are fearless and totally encapsulated, as is the injection unit. The completeness, size, functionality and dosing capacity of all the valves produced can be checked directly on the assembly lines. All the valves are laser-coded for total traceability. "We are the only manufacturer of these parts within the Lindal Group," remarks Giovanni Corti, plant manager at the Oggiono factory. "We are the aerosol competence centre for the international pharmaceuticals market."

From the initial idea through to series production

Every year the new factory in Oggiono produces several million valves with a diameter of 20 mm. To adapt the single components the valves undergo a customisation step, because each change of recipe requires appropriate materials and structures. V.A.R.I. has its own laboratory and engineering departments to cope with these requirements. "We offer our customers a full service, from product tests to design and concept, through to series production," says Corti.

The cleanroom for injection moulding production is the heart of the new pharmaceutical division. Five ENGEL e-motion fully electric injection moulding machines were commissioned here in late 2010. V.A.R.I.’s move to the new facilities also meant that the company switched to fully electric machines. "Our customers have increasingly strict requirements, and this is reflected in our product portfolio. To be able to go on meeting these requites in the future, we decided to invest in new injection moulding technology," Corti explains. "Fully electric machines ensure extremely clean operation and at the same time a high level of precision, and we need this for automated assembly downstream."

"Although Giovanni Corti had already used ENGEL machines at the former site, it was not merely a matter of course to continue working with ENGEL after the expansion and modernisation programme. Quotations from several machine manufacturers were examined and taken were held, with Corti paying attention to one thing in particular: the manufacturer’s cleanroom competence. “As plastics processors we ourselves have only limited experience in the pharmaceutical field,” Corti points out, “in other words we have to trust, absolutely, in the machine manufacturer’s experience and know-how.” And this was the point at which Corti quickly discovered major differences between the various bidders. Finally, ENGEL came in with an offer that proved convincing in all respects. The dependability and competence demonstrated by the Medical Business Unit were decisive for the purchase. But Corti also appreciates the proximity of ENGEL’s Italian subsidiary in Vimercate, just half an hour’s drive from Oggiono. The staff of ENGEL Italia were just as familiar with the details of the project as Christoph Urona, head of the ENGEL Medical Business Unit in Schwertberg, Austria. “Whenever I called with changes in the planning phase, everybody immediately knew what I was talking about,” says Corti.

To avoid wasting time during the planning and commissioning stages, ENGEL was entrusted – as a turn-key supplier – with the delivery of the e-motion presses, the automation systems, the laminar flow boxes and the mould change system. The turn-key package also included the documentation for the cleanroom equipment (with the EverQ certificates) in line with GMP practices.

"Our customers' requirements are getting tougher all the time."

Giovanni Corti, plant manager at V.A.R.I., Oggiono

A cleanroom concept throughout is an important competitive advantage for the plastics processor.
ENGEL Mexico has had a new manager since 1 February 2011. With Peter Auinger an experienced injection moulding machine expert has been acquired for this strategically important market. He joins ENGEL with the goal of positioning the company as a system supplier in Mexico and further developing its technical consulting business. Peter Auinger acquired many years of experience in sales executive positions in the plastics industry and in the context of these activities he has looked after the Latin American markets since 1 November 2010 the sales subsidiary in Turkey has been managed by Abdulkadir Topuçar. Previous to this he served many years with an international injection moulding manufacturer from the telecommunications industry, where he was responsible for a production facility. On the basis of his extensive experience in injection moulding he will be focusing in particular on the efficient use of ENGEL technologies in injection moulding facilities with the aim of further consolidating ENGEL’s market position in Turkey.

On 1 July 2010 Kurt Callewaert, a proven specialist in injection moulding technology, assumed the management of ENGEL BENELUX in Houten/NL. After many years in the plastics industry, Callewaert is now contributing his know-how to the ENGEL team in the Netherlands and Belgium.

On 1 July 2010 Kurt Callewaert, a proven specialist in injection moulding technology, assumed the management of ENGEL BENELUX in Houten/NL. After many years in the plastics industry, Callewaert is now contributing his know-how to the ENGEL team in the Netherlands and Belgium.

Since 1 November 2010 the sales subsidiary in Turkey has been managed by Abdulkadir Topuçar. Previous to this he served many years with an international injection moulding manufacturer from the telecommunications industry, where he was responsible for a production facility. On the basis of his extensive experience in injection moulding he will be focusing in particular on the efficient use of ENGEL technologies in injection moulding facilities with the aim of further consolidating ENGEL’s market position in Turkey.

Cross Border Award for innovative cooperation in the “three-country corner”

At the end of May the Cross Border Award 2011 was presented to ENGEL AUSTRIA for its commitment in the “three-country corner” between Upper Austria, Southern Bohemia and Lower Bavaria.

“The name ENGEL is omnipresent wherever plastics are processed,” with these words Dr Rudolf Trauner, President of the Upper Austria Chamber of Commerce (WKOÖ) praised the global commitment of ENGEL AUSTRIA. The Schwertberg-based company with eight production facilities in Europe, North America and Asia, together with subsidiaries and representatives in 85 countries, is the world’s largest manufacturer of injection moulding machines.

At the same time ENGEL stays faithful to its Upper Austrian roots and has strong links to the regional economy of Upper Austria and adjoining regions. This is evidenced by the construction of the Technology Centre in Schwertberg in 2009, as well as other investments at its Austrian locations and more recently in Kaplice, Southern Bohemia. ENGEL has a workforce of over 3,500 around the globe, most of them in Austria. The Kaplice facility has about 500 employees.

The competence centre for sheet metal forming, whose capacities are currently being extended, is located in Kaplice. Machine frames, electrical switch cabinets and oil reservoirs for injection moulding machine installation in Austria, as well as automation components for worldwide production facilities and automation centres, are manufactured in Southern Bohemia. By introducing conveyor belts ENGEL Strojírenská in Kaplice has also established its own range of products as an ideal complement to the ENGEL product portfolio.

Lower Bavaria is an important market for the ENGEL Group and is supplied by the company’s German subsidiary in Nuremberg. The main customer here is BMW. In addition, ENGEL cooperates with a number of automotive suppliers in Lower Bavaria.

According to the jury’s explanation of its decision, one of the main factors of success is the company’s distinct focus on innovation with the goal of technology leadership. For this purpose ENGEL employs a research and development team of over 100 persons. The average R&D outlay amounts to 4% of revenue. In addition, ENGEL is an integral part of the Upper Austrian technology network. For example, it is actively involved in establishing plastics technology at the University of Linz and is represented on the advisory boards of the Plastics and Mechatronics Cluster.

The Cross Border Award has been presented annually to companies and R&D establishments by the WKOÖ, Lower Bavarian Chamber of Commerce & Industry and Southern Bohemia Chamber of Commerce since 2003.