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Your challenges are our challenges

Three major international events are scheduled for the first half of this year: NPE in Orlando, USA, Chinaplas in Guangzhou, China and the ENGEL Symposium, which will be held here at home in Austria at our St. Valentin plant and the Design Centre in Linz. Consequently, we are looking ahead to a very exciting year of innovation in 2015. Everything kicks off with NPE in March, which takes place in one of the world’s fastest-growing markets. The US market is being driven by low energy prices and the revival of efforts to keep production in the country, while record car sales figures and a healthy climate for consumers are leading to high investment levels. In fact, the trend is moving at such a pace that many have likened it to a gold rush. As production volumes in the country increase exponentially, existing manufacturing facilities require modernisation. From technological, environmental and economic standpoints, machine parks are being equipped to meet the challenges of today and tomorrow. At NPE, we will be demonstrating how this can happen in practice with no fewer than eight manufacturing cells for five different application areas. The exhibits all clearly demonstrate that innovative machines and process technologies alone do not guarantee strong competitiveness; it is more important for individual manufacturing cells to be tailored to specific product requirements and customer needs. Needless to say, keeping the spotlight on customer needs and thus client benefits is a constant challenge that involves optimising costs while minimising delivery times. ENGEL is renowned for performing this balancing act thanks to outstanding proximity to its customers.

Chinaplas will take place from 20th – 23rd May 2015 in Guangzhou, China. With three plant facilities already established, Asia is another region in which we can boast a strong presence and market penetration. Requirements in China are developing along the same lines as those elsewhere in the world, with the focus here also on high-end technology. The highlight will be our Symposium 2015 – and you are invited. From 16th – 18th June, we trust you will join us for a glimpse into the future of injection moulding. Numerous ground-breaking exhibits will showcase the full range of our innovative flair – and I can promise that these new developments will be of interest to you too. We look forward to meeting you at the Symposium.

Dr Peter Neumann
CEO ENGEL Holding
News
Retrospective
Current Events

ENGEL worldwide. around the corner.
Fairs, events, projects

High performance with a small footprint
ENGEL and Uni-Cap at Arabplast 2015

The ENGEL HL-Awards 2015
Apply now! – In three categories

Five Star Industry Competence
Welcome to ENGEL at NPE2015 in Orlando, Florida

Controlled Conditions
ENGEL e-flomo improves process stability and economy

Fast, flexible and compact
ENGEL e-pic makes pick-and-place applications economically worthwhile

Open for innovation
ENGEL equips BASF processing laboratory with its system solution

A good grip on silicone processing
RAUMEDIC trusts tie-bar-less ENGEL e-victory machines

High precision for hidden helpers
Tie-bar-less technology provides efficiency for the fittings manufacturer Blum

Maximum flexibility from design to serial production
Lercher reduces its hourly rate with tie-bar-less machines
Pioneers in training
Economic delegation visits ENGEL in Shanghai

During a market exploration trip to China, the Austrian Vice Chancellor and Federal Minister of Science, Research and Economy Dr Reinhold Mitterlehner visited ENGEL’s Shanghai production plant for large-size machines together with a business and science delegation. The guests were above all impressed by the high standard of quality and the highly motivated staff. In particular, they were interested in ENGEL’s commitment to training. For the past year, ENGEL has been training its own skilled workers on location in Shanghai, and has subsequently exported the Austrian model of dual vocational training to China. This project has made ENGEL one of the pioneers in this area. Together with one of their partner companies, ENGEL itself built up the infrastructure necessary for the theoretical instruction and trained the teaching staff of the Shanghai Information Technology Colleges (SITC) in Austria. A visit to the SITC was also on the agenda for the delegation.

“The great interest shown by representatives from business, science and government encourages us to continue investing substantially in the training of our staff in China,” says Peter Garimort, Managing Director for production and personnel at ENGEL Machinery Shanghai. “In addition, it helps us to strengthen the already very positive cooperation with the educational institution on location.”

Cost efficiency in FRP lightweight engineering
Composites Europe in Düsseldorf

In October, ENGEL presented its lightweight design expertise for the first time at the Composites Europe trade fair in Düsseldorf, Germany, and provided insights into current research and successful customer projects. At its in-house Centre for Lightweight Composite Technologies, ENGEL works in cooperation with partner enterprises on developing economical processes for serial production of innovative fibre-reinforced plastic composite components. The current focus of the technology centre lies on the processing of semi-finished thermoplastic products and reactive technologies using thermoplastic and thermoset systems. ENGEL brought sample parts, videos and presentations on this topic to exhibit in Düsseldorf.

“One important precondition for successful FRP projects is that the materials, design and production process mesh in the best possible way. This can only work if enterprises bundle their expertise along the value chain.”

Peter Egger, head of the Centre for Lightweight Composite Technologies
25 years of partnership
SKS and ENGEL

25 years ago, ENGEL delivered the first injection moulding machine to SKS in Laupen, Switzerland. Many more have followed since then, and a close partnership has long since developed between the two family-owned businesses. Dr Peter Neumann, CEO of ENGEL Holding, thanked the two entrepreneurs, Karl and Michael Steiner, for this relationship during their visit to the ENGEL facilities in Schwertberg. “The cooperation with SKS is something special for us,” Peter Neumann emphasizes. “SKS, just like ENGEL, is strongly innovative and has the courage to take new paths with its partners again and again. We have already worked together to develop several advancements, and the Steiner family has always been open with their feedback. It is precisely this kind of close and honest cooperation that is an important pillar of success for medium-sized companies like us in western Europe.”

SKS specialises in small, high-precision components made of sophisticated high-performance materials. “Products that require very specific know-how and therefore cannot be produced by just anyone,” explains company founder and Managing Director Karl Steiner. The gears and other technically demanding precision injection-moulded parts made in Switzerland are found in use around the world. Their customers include small and medium-sized businesses as well as large international companies. For many of them, SKS puts together comprehensive packages: from product design and development to mould fabrication and series manufacturing, including assembly and logistics. SKS has also been working with many of its customers for several decades.

The average age of the machines at SKS is relatively low. Three new ENGEL machines were added to their operations at the end of 2014. Among them was an ENGEL e-motion 30 TL. For the company in Laupen, this is the second machine from ENGEL’s new all-electric and tie-bar-less small-scale model series. “When the shot weights are small, but the moulds are bulky because of the sliders, the tie-bar-less design helps us to keep the hourly rate stable even when costs are increasing,” says Karl Steiner.

SKS was one of the first customers in Switzerland to implement the tie-bar-less machines, developed 25 years ago, in their production operations. “Over the many years of our cooperation, we have always been provided with excellent support from Engel,” says Karl Steiner. “Above all, it is the close contact that is important for us when it comes to support. The prompt responses demonstrate again and again that ENGEL is truly very close to its customers.”

Highest performance meets maximum energy efficiency
Plastimagen in Mexico City/Mexico

Thin-wall injection moulding in combination with in-mould labelling was one of the highlights at the ENGEL stand at the Plastimagen 2014 in Mexico City in November. Drinking cups were manufactured on an ENGEL e-motion injection moulding machine.

Through the ongoing development of the ENGEL e-motion series, these all-electric machines are becoming increasingly well-established in the area of high-performance applications in the packaging industry. 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...
High-Tech and Middle Ages
Molder’s Corner in Hagen

With more than 600 guests from over 100 different companies, the Molder’s Corner 2014 in Hagen was bigger than ever. “The mix of top-class speakers, innovative machine exhibits and a very friendly atmosphere makes the Molder’s Corner something special year after year. Word of that makes the rounds in the industry,” says Rolf Saß, Managing Director of ENGEL Germany in Hagen. It was the 14th time that this ENGEL subsidiary has invited its customers and partners to exchange information and experience at the traditional event, and for this the facilities were transformed into a medieval town. After the presentations, a barbecue was held at the gates of the town, and various shows were featured. The audience particularly enjoyed the feats of the fire-breather.

“Once again a great success
LSR-Seminars in China

The importance of applications with liquid silicone is increasing in China, and European providers are experiencing growing demand for their system solutions. The goal of the LSR seminars organised by ENGEL, with its partners Dow Corning and Elmet, for mid-November in Shanghai and Dongguan was to demonstrate the market potential and introduce innovative processing technologies. It was the second event on this topic at both locations within the past year, and both seminars were again well attended. More than 330 processing professionals used the platform to inform themselves about the newest trends and developments and to exchange experiences. “The percentage of high-end applications

Save weight and cycle time
Interplas in Birmingham

In the automotive sector, material substitution is progressing more and more rapidly, and a growing number of functional components are also being manufactured from plastics. ENGEL presented one example for this at the Interplas in Birmingham in the autumn of 2014, demonstrating the production of clutch pedals with the ENGEL watermelt process on an ENGEL victory 220 injection moulding machine. Thanks to the targeted formation of a hollow structure by means of water injection technology, raw material is saved, the component weight decreases and the cycle time drops. Furthermore, the injection of water into a cavity partially filled with plastic melt ensures a uniform wall thickness throughout the clutch pedal and no sink marks despite the complex part geometry.

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is growing considerably,” says Gero Willmeroth, Sales and Service President at ENGEL Machinery Shanghai. “In order to be able to keep production competitive in the area of mass products for the long term, it is also essential to adapt production lines individually to the products, the quantities, and the materials.” With this in mind, the speakers discussed such diverse aspects as injection moulding technology, innovative materials, moulds and peripheral equipment. Among the speakers was Leopold Praher, Global Sales Manager LSR/LIM for ENGEL.

“With its system solutions, ENGEL enables its customers to achieve a fully automated production that is free of flashes, requires no reworking, and produces no waste.”

Leopold Praher,
Global Sales Manager LSR/LIM

World firsts and an anniversary
Fakuma in Friedrichshafen

The Fakuma 2014 was a great success for ENGEL. The machine manufacturer presented itself twofold in Friedrichshafen. In the East Foyer, the ENGEL tie-bar-less design celebrated its 25-year anniversary with a special exhibit, and at the main exhibit in hall A5, innovative applications from ENGEL’s five business units were at the centre of attention. For example, a world first was presented by the Teletronics division with an ENGEL e-motion 50 TL, impressively demonstrating how the tie-bar-less design still provides plenty of opportunities for innovation in its 25th year. The challenges of the electronics industry were a focus in the development of the new ENGEL e-motion TL tie-bar-less and all-electric small machine series. The trend towards ever higher productivity per square metre of factory space is particularly evident in this branch. Together with the very high demands on precision, this is the reason why all-electric machines have become the standard, especially for the production of particularly small electronic components. Thanks to the tie-bar-less design, ENGEL can now also offer a particularly compact production cell for its customers in this market segment. At the trade show, the ENGEL e-motion 50 TL operated together with an integrated ENGEL e-pic robot—another world first from ENGEL in Friedrichshafen. A third was presented by the Customer Service Division with the ENGEL e-flomo. In this advanced development, the cooling water flow monitoring system from ENGEL also takes over the fully automatic adjustment and control of the flow rates. Read more about ENGEL e-pic and ENGEL e-flomo on pages 14 and 15.

Preview of 2015

Kunststoffe im Automobilbau (Plastics in Automobile Manufacturing), Mannheim/Germany, March 18th – 19th
NPE, Orlando/USA, March 23rd – 27th
Elmia Polymer, Jönköping/Sweden, April 21st – 24th
Feiplastic, São Paulo/Brazil, May 4th – 8th
Plast, Milan/Italy, May 5th – 9th
International Engineering Fair, Nitra/Slovakia, May 19th – 22nd
Chinaplas, Guangzhou/China, May 20th – 23rd
Plastpol, Kielce/Poland, May 26th – 29th
ENGEL Symposium, St. Valentin und Linz/Austria, June 16th – 18th
DKT/IRC, Nuremberg/Germany, July 29th June – 2nd

An eminent guest for ENGEL at Fakuma: Dr Günther Horlatzky, State Secretary of the Ministry of Economic Affairs, Energy and Industry, North Rhine-Westphalia, Germany, in conversation with Rolf Saß, Managing Director at ENGEL Germany in Hagen. ENGEL has been actively involved in promoting competitiveness of the plastics industry in the state of North Rhine-Westphalia for many years as a member of the Verein Kunststoffland NRW (North Rhine-Westphalian Plastics Industry Association). (Image: Julia Unkel, www.mweimh.nrw.de)
At the Arabplast 2015 trade show in the middle of January in Dubai, ENGEL, together with Uni-Cap and other partners, presented its high competence in system solutions for the packaging industry. An all-electric ENGEL e-cap injection moulding machine was producing 1881-type caps live at the ENGEL stand. As a pioneer in the field, Uni-Cap is bringing this innovative lightweight cap to the Gulf States using ENGEL injection moulding technology.

"Sustainability is very important when it comes to investment decisions in the Arab countries, and the significance of environmentally friendly technology will continue to increase," says Andreas Leitner, Sales Director Middle East at ENGEL AUSTRIA. "All-electric injection moulding machines are becoming increasingly popular for the production of beverage caps." Uni-Cap in Dubai is also a pioneer in this area. The largest cap manufacturer in the Gulf States has been producing on ENGEL e-cap machines since 2009. In addition to the high energy efficiency of the machines, Bassam Hajjar, the CEO of Uni-Cap, is particularly interested in cleanliness. "The bottlers expect to receive absolutely hygienic products from us. With all-electric machines, we can definitely rule out any contamination with hydraulic oil. Thus, the usage of hydraulic oil is superfluous and at the same time cooling capacity is saved, and the carbon footprint can be decreased significantly."

While the one-piece 1881 cap for carbonated soft drinks has already become established in most parts of the world, the GCC countries have long remained the exception. Only the newest, state-of-the-art processing technology has allowed one-piece caps to be used in regions with extreme temperatures of more than 50 °C. Uni-Cap will be the first manufacturer in the region to produce this type of cap. They plan to achieve an annual capacity of 300 million caps with the ENGEL e-cap machine presented at the Arabplast. Currently, in total, Uni-Cap produces 4.5 billion caps per year.

50 percent less overhead for cooling

The high demands put on the injection molding machine are above all defined by the poor-flow types of HDPE, with melt flow rates as low as 1.5 g/10 min, that are required to achieve the specified cap characteristics. Thanks to its direct drive unit, the ENGEL e-cap achieves the precision and performance needed for this application. Beyond that, its increased ejection and clamping force help it attain very short cycle times.

Outstanding process stability and precision maximise the number of good parts. This is due, among other things, to the servo drive units. "With the ENGEL e-cap, we were able to markedly reduce the overhead for mould maintenance," says Bassam Hajjar.

Even with such impressively high performance values, the ENGEL e-cap achieves considerable savings on energy and cooling water, thereby cutting unit costs significantly. "In comparison to hydraulic machines, we need 50 percent less resources for cooling," says Hajjar.

Finally, a third decisive criteria – after sustainability and performance – for the Uni-Cap CEO is the after-sales service. "We achieve a high degree of machine availability. Spare parts are also made available on site very quickly."

System partnerships are cornerstones of success

System partnerships with leading international companies and local suppliers are cornerstones for joint success; a point that was underlined at Arabplast. In the area of packaging, one of the companies who presented themselves at the ENGEL stand in Dubai was Corvaglia. The supplier for the international beverage industry, with headquarters in Eschlikon, Switzerland, fabricated the 48-cavity mould for Uni-Cap, which together with the ENGEL e-cap inaugurated a new era in caps and closures technology in the Gulf States at Arabplast 2015.

"All-electric injection moulding machines are becoming increasingly popular for the production of beverage caps."

Andreas Leitner, Sales Director Middle East at ENGEL
The ENGEL HL-Awards 2015

ENGEL tie-bar-less technology opens up possibilities for more economical efficiency, flexibility and completely new process concepts—and has been doing so for more than 25 years.

ENGEL will be honouring outstanding tie-bar-less applications for the eighth time in the summer of 2015. For the first time, the prizes will be awarded in three categories:

- **Efficient use of the mould area**
  Large and bulky moulds on small injection moulding machines, easy mould changing and high ergonomics for the operator will dominate in this category.

- **Innovative process integration**
  Multi-component injection moulding, PUR and LIM processes, innovative processing technologies or clean-room applications—the jury will take a closer look at how quality can be combined with efficiency.

- **Economical automation concepts**
  Extremely compact robot integration, automation in low-ceilinged production rooms and increased productivity through reduced handling time are what it will take to convince the jury.

Are you also profiting from the benefits of the ENGEL tie-bar-less design? Then send us your own submission for the 2015 ENGEL HL-Awards by February 27!

All winners will be awarded a voucher worth 5,000 euros for their next machine investment, an image video and a dinner for their whole team.

The independent jury consists of representatives of business, science and media. The ENGEL HL-Awards 2015 will be presented on June 16 during the ENGEL Symposium's gala evening.

www.engelglobal.com/hl-award-en
Five Star Industry Competence

“It’s your choice to be a winner!” is the motto for ENGEL at NPE2015 from March 23 to 27 in Orlando, Florida. Presenting eight innovative applications, ENGEL will demonstrate how the specific requirements of five industrial branches—automotive, packaging, medical, teletronics and technical moulding—can be realised with efficient and economical injection moulding solutions. They will show that the key to increased competitiveness can be found in both customised, highly-integrated system solutions and flexible standard machines.

“The plastics industry in North America continues on a course of growth. In particular, there is an increasing demand for innovative techniques and economic solutions for high-performance applications.”

Mark Sankovitch, President and CEO of ENGEL North America

NPE highlights from the ENGEL Business Units

>> West Building, Hall A, Stand W1303

ENGEL automotive
Cost efficiency for high-volume lightweight construction

Lightweight construction is currently one of the areas with the strongest growth. “In the next few years we can look forward to strong growth in the injection moulding industry, particularly in the field of fiber composite engineering,” points out Mark Sankovitch, President and CEO of ENGEL North America. ENGEL and its partner ZF-Friedrichshafen will present a milestone in Orlando—a geometrically optimised and stress-resistant plastic brake pedal. The concept for manufacturing a hybrid, brake pedal from thermoplastic fabric received the Composite Innovations Award in 2011, and has been consistently enhanced by ZF since then. ENGEL will be offering a glimpse into the efficiency of the new manufacturing process at its stand at the exhibition.

Using a vertical ENGEL insert 1050H/230 single US injection moulding machine with an ENGEL easix multi-axis industrial robot and infrared oven, a continuous-fiber-reinforced thermoplastic semi-finished product will be heated, preformed in a mould and immediately over moulded with polyamide. The system produces ready-to-fit components; no cutting is necessary. The product developers at ZF have adapted the layer structure to the component load when designing the brake pedal. This enabled the component weight to be reduced by around 30 percent compared to conventional steel brake pedals—without impairing load-bearing capacity. In addition, the lightweight construction method makes many conventional manufacturing process steps unnecessary, thereby increasing productivity and cutting unit costs.

Dual technology integration opens new horizons for quality

Process integration leads to greater efficiency, safety and quality. Using an ENGEL duo 2550/660 US injection moulding machine with an integrated ENGEL viper 20 robot, ENGEL will demonstrate the fact that not only can process steps upstream or downstream of the injection moulding machine be combined, but also different process technologies. To produce center console components of PC-ABS, ENGEL will combine...
two technologies: ENGEL foammelt, the MuCell foam injection moulding process developed by Trexel, and the variothermal injection moulding process from Rocktool. The goal is to produce thin-walled parts with very high surface quality along with the excellent reproduction of fine structure using just a single injection moulding step.

**ENGEL medical**

**Higher productivity with a smaller plant footprint**

In the medical section of its display at NPE2015, ENGEL will be producing drip chambers with an integrated filter for blood transfusions. An ENGEL e-victory 310H/80W/50V/180 combi US three-component injection moulding machine with ecodrive and a cleanroom design will be used in this highly integrated production process. The drip chambers will include one ABS and one PP component; in a single work step they will be injection moulded, fitted with the filter, and joined by means of over moulding with additional polypropylene. This unprecedented level of integration significantly boosts efficiency in the manufacturing of multi-component hollow bodies with inlays. “Drip chambers are mass-market products that need to be manufactured economically while maintaining the stringent demands on product safety and cleanliness,” says Mark Sankovitch, underlining the great significance of the one-shot process.

**High performance with maximum safety**

In order to increase productivity, the field of medical technology is moving more and more to the use of multi-cavity moulds along with the larger injection moulding machines they require. As a result, ENGEL has designed the ENGEL e-motion all-electric machine series to meet the requirements of high-performance applications, with no compromise to process stability and part quality, even when used with high clamping forces. Together with automation specialist HEKUMA and mould manufacturer Braunform; ENGEL will be presenting the highly automated cleanroom production of needle holders for insulin pens at the NPE. The cores of the 96-cavity mould have a diameter of just 0.3 mm. To counter deformation of cores effectively, the electric injection unit of the ENGEL e-motion 440/240 T US is equipped with a direct drive, which provides highly dynamic injection movements and injection speeds of up to 500 mm/s. Despite the delicate mould cores, the all-electric machine achieves exceptionally short cycle times of around 3.5 seconds.

**ENGEL packaging**

**The best of two worlds**

High-performance applications have traditionally been the domain of the packaging industry, and the trend in that sector is energy efficiency. The new ENGEL e-speed 720 US injection moulding machine, presented in North America for the first time at NPE2015, brings together the best of two worlds. The new ENGEL high-speed machine relies on the all-electric technology of the high-performance ENGEL e-motion and ENGEL e-cap series while possessing the benefits of the ENGEL speed series; uniting highest injection speeds with maximum energy efficiency. The electric clamping unit of the hybrid machine utilizes a completely new drive solution. In order to avoid the power peaks when short cycle times are combined with high clamping forces, a flywheel acts as an electrical power reserve. This allows the ENGEL e-speed 720 US to run with a relatively low and above all constant connected load. Its particularly long opening stroke allows the new high-speed machine to work with large stack moulds.
An ENGEL e-speed 720/90 US with a 4+4-cavity mould from StackTeck will be producing 1.5-liter containers. Thanks to the high-speed automation from CBW automation the machine only needs a very short 0.5 seconds to remove the containers from the mould.

**ENGEL technical moulding**
Efficient multiple component injection moulding using standard technology

While process integration offers advantages for many multiple component applications, it is not necessarily the most efficient solution. In addition to the requirements of the part being produced, the planned lot size, conditions on site and the existing machinery are also important when choosing the best fabrication process. One alternative to production with a multi-component mould and an integrated manufacturing cell would be utilizing a transfer process to link two, or more, injection moulding machines with a linear robot. The transfer process is advantageous when standard technology satisfies the production requirements, as opposed to making customised specialty machines necessary. ENGEL demonstrates what this can look like in practice with the production of double-ended wrenches on a system using two ENGEL e-mac 170/55 US machines with four-cavity moulds from Roembke. The wrenches are made of carbon-fiber-reinforced polyamide which is over-moulded with silicone between the two ends for better grip. The part is injection moulded on the first machine in the cell, removed by an ENGEL viper 12 linear robot and immediately placed in the mould of the second injection moulding machine which is situated opposite. During the processing of the liquid silicone, the first machine has begun production of the next wrench.

**ENGEL teletronics**
Maximum precision for plastic/metal composites

It is often useful to make use of gravity for insertion applications. During the trade show, ENGEL will be producing connector housings on a vertical ENGEL insert 500H/110 rotary US injection moulding machine. In order to overmould the metal pins directly, an ENGEL easix robot will take four sets of metal pins from the feeding unit and place them in the bottom half of the four-cavity mould, which has been provided for demonstration at the exhibition by Capsonic. Once again, with this application the multi-axis robot demonstrates its high positioning accuracy. The precision of the robots movements is crucial for final product quality in many insertion applications. The complete automation of the manufacturing cell was designed and built by the ENGEL automation team in York. In order to pose a challenge to the flexibility of the ENGEL easix robot, two different and independent feeding systems have been integrated, and will be in operation on an alternating basis at the exhibition. The robot must repeatedly adapt itself to the changing demands of the process and yet still fulfill all its tasks with consistently high precision.
**25 tie-bar-less years**
A success story with future potential

"25 tie-bar-less years"—ENGEL will be celebrating this anniversary at the NPE with an ENGEL victory 330/85 tech US machine, which will be producing fittings for drain systems. The production of fittings makes optimal use of the tie-bar-less technology. Although the mould provided by ifw-Kunststofftechnik for the production of the fittings at the NPE is of substantial size, it can still be mounted on the 85-ton machine quickly and easily. "If we were using a traditional machine with tie-bars, we would need a much larger machine with a clamping force of at least 150 tons in order to fit the bulky mould. We would also have to remove a tie bar or disassemble core-pulls to set up the mould," says Mark Sankovitch.

**Automation**
From a simple pick-and-place to a turn-key solution

From the dependable standard machine to the highly integrated and automated manufacturing cell developed under one roof, ENGEL provides solutions with maximum economical efficiency for its customers around the world. In the turn-key business, the processor has only one contact partner for the entire system right from the start, which can markedly reduce the time needed for project planning and commissioning. Even when individual components are provided in collaboration with partners, ENGEL bears the overall responsibility. "The segment of system solutions is steadily increasing in our business," says Mark Sankovitch. "ENGEL is delivering more and more injection moulding machines with handling included." Automation is increasingly becoming an integrative process component which not only makes production processes more efficient and economical, but also makes it possible to realise totally new manufacturing methods, component characteristics, design solutions and product qualities. In order to also be able to offer a very economical, dynamic and compact solution for simple pick-and-place applications, ENGEL has developed a new compact robot for horizontal and vertical part removal. At NPE2015, the ENGEL e-pic will be presented to the American audience for the first time (Page 15).

**ENGEL plus**
A new service portal for even greater customer benefit

Training and service are integral features of the ENGEL system philosophy. Under the ENGEL plus brand name, ENGEL offers not only fast hotline and on-site support worldwide, but also a wide range of optimisation tools that ensure greater efficiency and process stability, increase machine and production cell availability, and help optimise processes. ENGEL plus is being presented at the NPE in several expert corners, with one feature being the new ENGEL customer portal. ENGEL will be presenting the new customer portal for the first time worldwide, at NPE2015. Now customers can make service requests and order spare parts even more easily and quickly than before. Another positive aspect is the high level of transparency. The customer can, for example, track the status of a service request, which makes it possible to plan more reliably. The new customer app opens the doors to the world of ENGEL, as well as one’s own manufacturing facility, anywhere and anytime. A concise overview of the current status as well as the availability of all machines can be displayed in the app. "Our innovative strength at ENGEL is demonstrated not only in products and technologies," says Mark Sankovitch. "It is also our goal to continuously increase the benefit customers have from our service."
Mould temperature control has a significant influence on productivity of the manufacturing process and on the quality of the moulded parts, but despite this, for a long time it did not attract a great deal of attention. ENGEL prompted a change in thinking when it developed ENGEL flomo in 2010. The injection moulding machine integrated, compact and manually adjustable water manifold system improves process reliability and facilitates process optimisation. For Fakuma 2014, ENGEL took the step from process monitoring to process control. The newly developed ENGEL e-flomo also features electrical control valves, which allow the flow rates to be adjusted and controlled in a fully-automated process.

Automatically compensating for fluctuations in the water quantity

The available volume of water can fluctuate during production, for example if filters clog, or system pressure changes are caused by different levels of load on the production equipment. In a production environment, these influences often go unnoticed for a long period of time, resulting – in the worst case – in the production of scrap. Even the manually adjustable ENGEL flomo water manifold can prevent this thanks to its monitoring feature. The new ENGEL e-flomo does not just monitor, it automatically adjusts the settings. If the system notices a flow rate dropping in one of the flow circuits, the corresponding control valve is automatically opened to a position where the desired target value is reached again.

Keeping the temperature under control

The temperature control device is responsible for keeping a constant media temperature. Since a certain amount of heat loss is typical between the temperature control unit and the mould, the ENGEL e-flomo also monitors the supply water temperature throughout the entire production run. At the same time, other parameters can be included for monitoring; for example, the return temperature or the temperature difference between the supply and return sides. ENGEL e-flomo is designed for water temperatures up to 120 °C. Shut-off valves in the central supply and return lines allow for fast and easy activation and deactivation of the individual manifold units. Just like the ENGEL flomo, the new ENGEL e-flomo is characterized by its resistance to soiled water.

Thanks to its functionality, ENGEL e-flomo improves the economy of the production process through fast mould set-up, higher machine availability, and reducing scrap.

The trend towards complete process monitoring has now reached mould temperature control. The typical, legacy water manifolds are therefore increasingly being replaced by state-of-art flow monitoring systems, such as ENGEL flomo. ENGEL e-flomo sees ENGEL take this one step further. The flow control system does not just monitor the relevant parameters, but keeps them constant throughout the production run.
Fast, flexible and compact

ENGEL e-pic – this is ENGEL AUSTRIA’s revolutionary response to the demand for maximum efficiency in pick-and-place applications with small moulded parts and sprues. Thanks to its innovative kinematics, the robot works particularly quickly, while at the same time saving space and using energy efficiently.

The ENGEL e-pic was celebrating its world premiere at Fakuma 2014 in Friedrichshafen, Germany. "The level of automation is continuing to increase rapidly worldwide. In Europe, we are seeing a trend away from free-falling parts from the mold," says Dr Stefan Engleder, CTO with ENGEL, when introducing the new development at the fair. This statement unequivocally confirms the fact that in addition to tailored automation solutions, the need for flexible and, at the same time, standardised robots for simple handling tasks is growing. This new development now sees ENGEL cover the complete spectrum of handling requirements in injection moulding in an even better way, from simple part removal, depositing, and sprue separation, through sophisticated insert-placing and take-out, to combining various process steps in a highly-integrated production cell.

Linear motion with integrated swivel arm

The objective in this product development was to combine maximum performance with maximum economy. The totally new kinematics makes a decisive contribution towards achieving this by combining linear movements with a swivel arm. Another important efficiency factor is the use of weight-optimised parts which keeps the accelerated masses low. In this way, the servomotor-driven robot can achieve the shortest possible take-out cycles, with only low energy requirements. In comparison with linear robots of the same size, the ENGEL e-pic needs only half the amount of energy. The compact design also contributes to its excellent efficiency. When deployed on injection moulding machines with an integrated conveyor belt, the ENGEL e-pic works inside the machine’s safety gate without needing extra space. And it needs far less vertical space than comparable third-party robots.

Immediately ready for action

Equipped with its own control unit, the ENGEL e-pic robot can be deployed not only on ENGEL injection moulding machines but also third-party machines, without needing any machine-specific customisation. A separate base is not required, nor is an external switch cabinet. The electronics are completely integrated with the mechanical superstructure.

"With the new ENGEL e-pic pick-and-place applications can be automated very economically."

Dr Stefan Engleder,
CTO, ENGEL Holding

In combination with an ENGEL injection moulding machine, the robot can be easily integrated with the CC300 machine control unit. The robot and machine then access a shared database, thus enhancing process assurance and operator convenience, while achieving efficiency optimisations in production sequences. The robot control unit supports intuitive control via the touch panel. When installed on a new or existing machine, the robot can immediately be commissioned, without programming skills. The control unit converts the rotary motion of the robot swivel arm into a linear movement. Those who are used to working with linear robots do not need to learn new skills. The ENGEL e-pic is designed for horizontal and vertical part removal and handling of small parts and sprues with a load-bearing capacity of up to 2 kg. It is deployed on injection moulding machines with clamping forces up to 2,200 kN.
Open for innovation

Solutions with continuous fibre-reinforced thermoplastics are an important key to increasing the use of composite material technology in vehicle construction. With Ultracom®, BASF follows this emerging trend. The product and service package includes not only semi-finished material made of continuous-fibre-reinforced laminates and tapes and specific corresponding compounds, but also support for product development and manufacturing. For this, the chemical company relies on the injection moulding technology from ENGEL. Because flexibility is what counts most at their technology centre in Ludwigshafen, Germany.

It all began at the K 2013 trade fair: in search of a partner for testing new processing technologies for lightweight construction research, the thermoplastics specialists from Ludwigshafen visited the ENGEL engineers at their stand. Three months later a contract was signed, and in the autumn of 2014, the new production cell was put into operation. “We were quickly convinced that ENGEL would be able to meet our very special demands. In addition, it was important for us to obtain an integrated system solution from a single source,” reports Dr Reinhard Jakobi, Head of Processing Technologies in the Engineering Plastics Europe Business Unit of BASF SE. The demands were complex and markedly higher than what is usually the case in the injection moulding industry. After all, no one can reliably predict where the developments in the processing of fibre-reinforced thermoplastics will lead in the next few years. The production cell must therefore be able to cover a particularly broad spectrum of applications and processing methods right from the start.

On the foundation of an ENGEL insert 400 injection moulding machine, ENGEL developed a tailor-made solution together with BASF. “The result is a combination of injection moulding machine and precision press,” explains Claus Wilde, head of the ENGEL Deutschland Technologieforum Stuttgart. “Until now it remains a unique solution, but it certainly could start a trend in the processing of composites.”

The thermoplastics processing technology centre at the BASF headquarters in Ludwigshafen has two purposes. For one thing, it supports on-site product development by manufacturing demonstration parts to test the processability and other properties of new materials. For another, the technology centre is available for joint development in cooperation with customers—and this aspect gains in significance in connection with Ultracom®. “Our support for the design and manufacturing process is not just a supplement to our products, it is an essential part of all customer projects,” as emphasised by Leonhard Ullrich, who was responsible for acquiring the new manufacturing cell for the processing technologies team.

From 40 to 400 tons in one cycle

Besides the ENGEL insert 400 with a nominal clamping force of 400 tons, the system solution that ENGEL delivered includes a fully integrated heating plate and temperature control system from Dr. Collin GmbH in Ebersberg, Germany. The flexible design of the clamping unit makes it possible to press sheets up to a size of 450 x 450 mm, as well as to mount injection moulds with a surface area of up to 700 x 1200 mm.

The fact that the injection moulding machine is not only used for injection moulding, but also to preheat, consolidate, press and form fibres and semi-finished material was a great challenge, particularly for the technology needed to control the process. Heating up at low pressure, increasing the pressure at a constant temperature, and then sinking the temperature at a constant pressure—such processing profiles are...
unknown in conventional injection moulding processes. "We must melt the semi-finished material under almost no pressure at all in order to avoid displacing the fibres," explains Andreas Nixdorf, project engineer at BASF. "We use less than 10 percent of the injection moulding machine's nominal pressure. For consolidating the semi-finished material, we then increase the pressure moderately."

In order to regulate the pressures and temperatures throughout the entire process with utmost precision, profile programmes were developed specifically for BASF, and the temperature control system from Dr Collin was also integrated into the controls for the injection moulding machine. All relevant parameters—for example speed, in addition to pressure and temperature—can be set, monitored and documented with the central machine control unit. This is particularly important for parameter research, for which BASF has developed their own demonstrator part.

Realistic conditions with convenient manual operation
The ENGEL insert 400 is the largest machine in its series, and that size is an optimal solution for the BASF technology centre. In contrast to smaller laboratory systems, real production moulds can be mounted on the machine. At the same time it offers more convenience for manually controlled processes, the kind that prevail at the technology centre, than the larger ENGEL v-duo presses which were developed for highly automated series production. In order to inject both in the parting plane and through the surface of the platen faces, the ENGEL insert is equipped with a deflector plate. "Some customers bring their own moulds," says Ulrich Schneider, master technician at the BASF technology centre. "With the deflector plate, we can also set up moulds that were designed for horizontal machines."

The vertical clamping unit offers many benefits for development projects in the area of composite material technology. Above all, working in the direction of the pull of gravity makes it easier to handle inserts. Flexible material does not need to be fastened in the mould, and the 0.16 to 0.25 mm thin tapes, which are taken from the roll, can be consolidated in alternating directions without making extra measures necessary.

One current area of focus for application engineers from Ludwigshafen is research on the processing of tapes. "We are confident that we can achieve better strength and rigidity through selective reinforcement at specific locations of the part than with laminates," Jakobi says. In this way, parts can be more effectively designed according to their load path, and the selective use of expensive UD-fibres makes more lightweight and cost-effective construction possible.

The next steps together with the users
There is a great market potential for fibre-reinforced thermoplastics. In contrast to thermoset systems, they manage to balance high performance and low component weight on the one hand with economical serial production on the other. Beyond that, functional elements can be integrated directly during the injection moulding process. Both the manufacturers of the material and the manufacturers of processing and automation machines have acquired a great amount of know-how for composite materials and have set important milestones. Numerous cooperative partnerships have been established all along the value chain, so that now end-to-end system solutions can be offered from a single-source. "We are prepared!" says Reinhard Jakobi. "We now expect the automobile manufacturers and their suppliers to develop trust in the new technology." BASF and ENGEL both agree that there is often a lack of entrepreneurial courage. Both companies also agree that further milestones can only be reached together with the processors and OEMs.
A good grip on silicone processing

The processing of liquid silicone puts particularly high demands on the precision of injection moulding technology. That is precisely the reason why RAUMEDIC trusts tie-bar-less machines from ENGEL. On an ENGEL e-victory 310/180, the manufacturer of systems and components for the medical technology and pharmaceutical industries produces moulded parts out of silicone for nutrition pumps in a class 7 cleanroom.

"The injection moulding process is advantageous for this product in comparison to extrusion," reports Jörg Prescher, head of the technical centre of excellence silicone moulding at RAUMEDIC, during a visit to their headquarters and production site in Helmbrechts by the editorial staff of Injection. "The tolerance for the inner diameter is less than two percent. In addition, it is very easy for us to integrate functions such as locking elements, connectors, membranes or pressure sensors." With its expertise in injection moulding and extrusion, assembly and material, RAUMEDIC unites diverse fields of competence under one roof, and can develop the optimal production solution and material combination for its international customers. Besides silicone, they also process a large spectrum of thermoplastics. The silicone moulded parts for nutrition pumps are part of a complete component group, which also includes a polycarbonate housing, among other things. "We are the right partner for system solutions that require very specific know-how," says Dr Thomas Jakob, director of the Moulding/Pharma Solutions business unit at RAUMEDIC.

Process liquid silicone safely and without flashes

Utmost cleanliness and precision are the top priorities for RAUMEDIC production, and also the prerequisites for correct and safe functioning of the nutrition pumps. Fluctuations in the inner diameter are just as unacceptable as tiny silicone particles that could break off from a flash. Both would impair the precision of the dosage and under certain circumstances could endanger the life of the patient. "125 ml per hour +/- 5 percent—those are the requirements," says Jörg Prescher. "We were able to demonstrate to our customers that we even achieve less than two percent."

This is possible when the material, mould and machine are perfectly coordinated with each other. In order to guarantee the highest process security and precision on the part of the injection moulding machine, RAUMEDIC trusts ENGEL e-victory hybrid machines with electrical injection units and tie-bar-less clamping units. "We have compared injection moulding machines with and without tie bars," says Jörg Prescher. "The results showed that the tie-bar-less machine achieves a better overall performance." The flexible central element is the design element that is responsible for this. It makes it possible for the moving platen to follow the mould precisely while clamping force is being built up. To achieve this, the platen lifts itself from the guide shoes, and automatically aligns itself to the stationary platen. The force divider distributes the clamping force evenly across the entire cross-section of the mould. "When the mould is mounted perfectly, this results in an absolutely constant compression," explains Leopold Praher, sales director for elast/LIM at ENGEL AUSTRIA. "Thus, with tie-bar-less injection moulding machines, we can also process liquid silicone that is consistently safe, free of flashes, and requires no reworking."

In addition to the moulded parts for nutrition pumps (left), RAUMEDIC also manufactures many other products out of silicone.
Flexibility ensures future viability

There is yet another reason for the fact that RAUMEDIC trusts tie-bar-less machines: the ability to put together particularly compact production cells. The mould for the tube components is 850 mm wide and weighs 1.7 tons including the part handling components.

"Thanks to the tie-bar-less design with a widened C-frame, we can achieve this project on a comparatively compact machine with 180 tons of clamping force," reports Mario Toff, sales engineer for ENGEL in Germany. "In a cleanroom, the floor space is even more valuable than in non-regulated production areas."

In addition, the large platen faces and the unobstructed access to the mould area speed up mould set-up and make automation less complicated. "Our goal is to be very flexible with our machine park," says Jörg Prescher. "The tie-bar-less machines from ENGEL provide the optimal prerequisites to realise this. They are our universal machines."

Flexibility ensures RAUMEDIC’s future viability. As production service provider and partner for development, the company must adapt daily to new customer requirements. It is no wonder that RAUMEDIC also expects the same amount of flexibility and strength in innovation from its suppliers. The RAUMEDIC project managers and the experts at ENGEL regularly exchange information and discuss current requirements, innovative technologies and future trends. "We take new ideas back home with us from every meeting that we then use for further developments," Prescher says. "These innovation workshops are very important to us. We are very happy that our partner ENGEL also pushes this forward proactively."
In 1992 we acquired our first tie-bar-less injection moulding machine, an ES 200/40,” recalls Gerold Wund, process technician at the Blum production facilities in Fussach in Vorarlberg, Austria, on the occasion of the 25th anniversary of ENGEL tie-bar-less technology. “That 40-ton machine is still in use today.” Many more tie-bar-less machines have joined it since. Today, 85 percent of the injection moulding machines at Blum production sites worldwide are tie-bar-less. The ENGEL e-victory has become their favourite model, and they have both one- and two-component variations in operation.

For ENGEL, Blum is not just a customer, but also a partner in development. “We are familiar with every generation of machine and control, and were always among the first to test the new kinds of articulation in production. Over the many years of our collaboration, we have learned much from each other,” says Manfred Schatz, plastics technician at Blum. “We bought our first tie-bar-less machine in order to test the advertised benefits,” Schatz continues. "We are now convinced that we can best solve our current challenges with this machine design."

The top efficiency factor is the barrier-free mould area. Since there are no tie bars in the way on tie-bar-less injection moulding machines, the entire surface area of the mould-mounting platen can be utilized up to the very edge – and sometimes even beyond. Therefore, large, bulky moulds can be mounted on relatively small injection moulding machines. “The only important thing is that the cavities are placed within the limits of the mould-mounting platen,” clarifies Franz Pressl, product manager for tie-bar-less ENGEL victory and ENGEL e-victory machines at ENGEL AUSTRIA in Schwertberg, Upper Austria. “The force divider – the current generation of the central flexlink – ensures that the same clamping force is applied to cavities at the edge of the mould-mounting platen as is to those in the middle."

Maximum use of the mould-mounting platen
Blum designs and builds about half of its moulds in their own in-house mould fabrication shop. Very early they began to optimise the moulds specifically for use in their tie-bar-less injection moulding machines. For example, some of the moulds are tapered towards the bottom so that they protrude down into the machine, while mechanical appliances are often mounted on both sides of the mould-mounting platen. 1232 mm..
wide, 1098 mm high and 708 mm deep – these are, for example, the measurements of a 16-cavity mould for producing fixtures for mounting and centring drawer fronts. The precision parts, in cylindrical form, were produced with a 200 ton ENGEL e-victory machine. "For a traditional machine with tie bars, we would have to plan for a model with much greater clamping force in order to set up a mould of this size," explains Manfred Schatz. Nothing can be seen of the platens on the 200-ton machine during production of the fittings. In every detail, the mould exploits the advantages of the tie-bar-less technology. The servo motors for cutting the threads are mounted to the left and right beside the cavities and outside the platen face. The mounting fixtures are mass production pieces that Blum produces on at least one, but often on two machines, operating 24/7. In order to reliably mould even fine structures with edge lengths on the millimetre scale, Blum places high demands on the precision of the injection moulding machines. With their electrical injection unit and the servo-hydraulic clamping units, the ENGEL e-victory hybrid machines fulfill these demands quite economically – a second efficiency factor. "The tie-bar-less ENGEL machines constructively achieve a higher parallelism of the mould mounting platen compared to machines with tie bars," says Franz Pressl. "That ensures maximum precision and minimum wear on the clamping unit."

More degrees of freedom for mould design
In order to continuously improve economical efficiency, the fittings specialist also follows the trend to multiple-cavity moulds. Blum speaks of ratio-moulds when on the basis of smaller, well-established moulds the cavities are doubled or quadrupled. Thus the largest moulds currently employed by the company contain 128 cavities. A third efficiency factor of the tie-bar-less injection moulding machines finally comes into play for this scale-up: the freedom for product and mould design. "We hardly have to worry about the mould mounting situation and can also freely place the cooling connections anywhere," says Wund. In the eyes of the company in Vorarlberg, the importance of mould tempering is growing quickly. Accordingly, the number of cooling cycles per mould is also growing. If a mould is intended for a typical injection moulding machine with tie bars, then the design engineers must take care that the cooling connections are not placed at the same level as the tie bars.

"A tie-bar-less clamping unit in connection with high precision – for us that is the ideal combination for most applications," summarises Manfred Schatz. At Blum, they also consider themselves to be well-equipped for the future, because cost pressure will continue to increase, making production efficiency an increasingly important factor.
Maximum flexibility
from design to serial production

As a mould manufacturer and injection moulding subcontractor with an open ear for tricky requests and unconventional solutions, Lercher has become a specialist for high-tech mass products. High demands are placed on the injection moulding machines, not only for maximum precision and efficiency, but also for flexibility. That is the reason that their machine park is 100 percent tie-bar-less.

It was a partner company that gave the initial impulse to purchase the first tie-bar-less injection moulding machines from ENGEL more than ten years ago. “We have looked at other machines on the market since then,” says Sandra Ender-Lercher, Director of the Lercher GmbH. “but we have chosen to stay with ENGEL.” Tie-bar-less machines offer great advantages for mould fabrication, and as a subcontractor, they enable us to achieve a low hourly rate.”

Small machines for large moulds
The moulds are designed and fabricated on the ground floor of the company building in Klaus in Vorarlberg, Austria, while the injection moulding department is found one floor above. Both business areas are growing continuously. In 2014, six new injection moulding machines were put into operation, and it was four the previous year. The preferred model is the ENGEL e-victory hybrid machine with ecodrive, and more frequently they are ordering injection moulding machines with handling robots included. All their machines are used for sampling, pilot series and large scale production. Production runs 24/7 in three shifts. Around one million injection moulded parts leave the plant each day, many of them in small batch sizes which requires frequent changes to the mould set-up. ”We are quite fast when it comes to mould set-up,” says Ender-Lercher. “The moulds don’t need to be manoeuvred between any tie bars, so we can also work more safely. On machines with tie bars, it can sometimes happen that the mould collides with the tie bars.”

Stack moulds, multi-component moulds, twist-out moulds and multiple-cavity moulds make up the greatest part of their fabrication. While these applications all require large and bulky constructions, the projected part areas are comparatively small, so that the required clamping force remains relatively low. In this case, the tie-bar-less technology makes it possible to choose the machine size according to the amount of clamping force actually needed instead of according to the size of the
mould. "Particularly when it comes to technical parts, the tie-bar-less technology often makes it possible to use a far smaller injection moulding machine than the mould size would otherwise require," confirms Franz Pressl, product manager for the tie-bar-less ENGEL victory and ENGEL e-victory machines at ENGEL AUSTRIA in Schwertberg. "That is precisely the key to low investment and maintenance costs, and therefore also to greater competitiveness."

More design flexibility, more ergonomics
When the Injection editors visited the plant, just such a bulky mould was standing on the production floor, awaiting delivery. Very soon it will be producing furniture fittings 32 pieces at a time. There is one slider per cavity, each with three cores, and together all these mechanisms take up quite a bit of space. "We test the mould on an ENGEL e-victory machine with 200 tons of clamping force," explains Dominik Lercher, who manages the family business together with his sister Sandra. "If we were to use an injection moulding machine with tie bars, the space between the tie bars would have to be very large in order to allow this mould to be mounted. Typically this would mean a machine with at least twice the clamping force. Apart from costing us more floor space, this would also mean higher investment costs."

If the moulds are intended for their own in-house production, the Lercher design engineers make optimal use of the advantages of the tie-bar-less technology right from the start. Many moulds are designed in the shape of a "T", so that they protrude down into the ejection chute, while motors for the moving parts of the mould are often placed on either side beyond the edge of the mould mounting platen. "We enjoy the great flexibility possible for designing parts and moulds," says Dominik Lercher, pointing out the most important advantage of the barrier-free clamping unit from the perspective of mould fabrication. "Besides that," Lercher continues, "we also benefit from the unobstructed view of the mould, and that the mould is readily accessible, whether for maintenance, cleaning, or replacing inserts."

Faster service for minimal machine downtime
From thermoplastics to bio-polymers, reinforced materials, thermoplastic elastomers and composite materials, Lercher processes a wide spectrum of polymers. Besides the furniture fittings industry, they also have customers in the automotive, medical technology, consumer products, renewable energy, aviation, packaging and electronics industries. Across all these industrial branches, the demands on the flexibility of the suppliers and on the quality of the end-products are continually increasing, while unit costs must continue to decrease. "With ENGEL, we have the right partner to achieve this," says Sandra Ender-Lercher. "And the service is exceptional, too. Our contact persons are well-organised and reply very promptly. That means minimal machine downtime for us when we need service."
See The Possibilities

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.

Visit our website for more information on tie-bar-less projects.

www.engelglobal.com