Engineering Passion

AHEAD
THE CUSTOMER MAGAZINE OF KRAUSSMAFFEI Issue 02.2014

NEW CX
KRAUSSMAFFEI’S SMALLEST BECOMES TOP OF THE CLASS

… you’ll have no trouble with this:
the MC6 control system from KraussMaffei

Intuition meets technology
MC6 technology from KraussMaffei sets standards in regard to speed and intuitive operation and makes work easier and more efficient than ever before.

– Everything in view thanks to SplitScreen and ProcessDesigner
– Tap and swipe – just like a smartphone
– Destination reached with just two taps
– Increased energy efficiency thanks to the Eco button
– Machine can be operated through the robot handheld pendant

www.kraussmaffei.com
Dear readers,

Trendengineering is continuing to take hold. After the impressive technological leaps that garnered very positive feedback for us at the K 2013 trade fair and long afterwards, we are now presenting the new brilliant achievements of our developers. The objectives remain the same. Now as before, material and energy efficiency, speed, high flexibility and long run times are at the forefront of our user-oriented endeavors. Our innovative technological approaches for a wide variety of applications open up new paths for a large circle of processors to achieve greater cost-efficiency in production and greater competitiveness.

Integration and combination – these are the big trends for us. Both promise our customers ever-increasing, new levels of efficiency and performance. Integration – this can be the combination of as many process steps as possible between material processing and packaging of the finished product in a fully automated system. But it can also be the combination of various processes in one machine, such as combining injection molding with reaction technology. And the combination of electric and hydraulic drives in a hybrid system can substantially contribute to reducing costs.

Technical progress – for KraussMaffei, this not only means large leaps in technology, but an equal measure of many smaller steps for optimization, including those targeting specific applications. The objective is not always to develop entirely new machines. Often our customers receive at least as much benefit if we bring our tried-and-tested models up to the latest state of technology. You can check out examples from both development strategies at the Fakuma 2014 trade show.

The focus at the trade show is our small standard machines from the CX and AX series, with hydraulic, hybrid and electric injection molding technology, as well as the EcoStar series with reaction technology. The applications demonstrate the peak productivity level and innovative detailed solutions with respect to energy efficiency, automation, compactness and zero-defect production. A look at our CX series is particularly worthwhile. We have thoroughly reworked the series and made it future-proof for many more years.

Be curious!

Nicolas Beyl
President of the Reaction Process Machinery segment
Vario nozzle Development features a wide processing window, high mixing quality and low maintenance expenses.

Multi-component injection molding Customized Multinjection machine with customized solutions.

New CX Peak productivity and innovative detailed solutions with respect to energy efficiency, automation and zero-defect production.
15% faster
10% less energy
30% quieter
20% less oil
25% more efficient thanks to APC

= 100% ADDED VALUE
NEW CX SERIES FEATURES MANY OPTIMIZATIONS

KRAUSSMAFFEI’S SMALLEST BECOMES TOP OF THE CLASS

Space, time and material – these variables determine how efficiently a processing plant can manufacture plastic. How many machines should be set up in the production hall? What are the possible cycle and set-up times? How can the need for electricity, compressed air and masterbatches be reduced? The new CX from KraussMaffei takes advantage of savings potential in all three areas.

TEXT: DR. SABINE KOB  PHOTOS: KRAUSSMAFFEI

KraussMaffei

Cover story

NEW CX SERIES FEATURES MANY OPTIMIZATIONS

From hydraulics to control software to automation, every component in the tried-and-true CX machines in the small clamping force range was subjected to testing and desired improvements were defined. Dr. Hans-Ulrich Golz, Managing Director and President of the Injection Molding Machinery segment for the KraussMaffei Group, stated, “Our objective was to take the already successful CX line and orient it even more consistently to customer needs. Plastics processors should have the option of producing plastic with outstanding cost efficiency and flexibility.” The new CX in the series of small machines up to 1,600 kN has become top of the class thanks to a large number of individual innovations. Götz Scheibe, Product Manager, says with enthusiasm, “We were in fact able to technically implement all of our customer requirements: 10 percent less energy, 15 percent faster, 30 percent quieter, oil volume reduced by 20 percent – 25 percent greater efficiency means 100 percent added value for the customer! Additional highlights specifically for small machines include the new sprue picker and the Blue-Power Vario drive concept.”

Space advantage: Two-platen design, sprue picker, removable tie bars

The CX has always cut a fine figure; its two-platen design takes up less installation area than longer three-platen models. In addition, a cantilevered clamping unit provides enough space underneath for mold temperature controllers or removal equipment. As a result, the extremely compact manufacturing cell is also ideally suited for use in locations such as clean rooms.

The new servo-sprue picker from KraussMaffei’s automation division also features a very compact and stable design. The telescoping stroke makes the picker particularly well suited for use in low halls. It forms one unit together with the machine, providing the best solution on the market as a result. The detached sprue is stored within the standard machine’s housing. This means that a side expansion in the form of a protective fence is not necessary. The way four machines can be installed in the same installation area instead of three. The servomotor enables the sprue picker to operate extremely fast and saves on maintenance time and expensive compressed air compared to wear-prone pneumatic drives. The all-in-one MC6 control system and the optimized parked position for the mold change round out the user-friendly features.

Molds are becoming ever larger and more complex in the small area as well. Contract manufacturers in particular have to make fast changes, even with complex molds, in order to facilitate cost-effective production. A simple manual bar-pulling device is an ideal option here for changing complex molds faster. For frequent changeovers, customers can also use a fully automated bar-pulling device.

The newly developed ejector coupling makes it easier to change molds and is capable of compensating for small axis offsets between the mold and ejector.

The standard CX already provides more space for molds. Since KraussMaffei is not satisfied with just the standard, you have the option of choosing between different platen sizes and spacing. This makes it possible to enlarge the mold volume by another 40 percent.

An additional advantage is that for some applications, the machine can even be sized smaller than before. The complex design of molds for multi-component injection molding machinery often makes them too large for a machine that has sufficient clamping force. The 13 percent wider platens enable such applications to be produced on a CX 130, while the competition needs a 160 t machine. Scheibe emphasizes, “The 20 percent benefit for efficiency is plain to see: Reduced machine hourly rate and lower operating costs.”
New time calculation: Fast clamping unit, screwless cover, sound insulation

In a nutshell, the new CX clamps about 15 percent faster on average. For high-volume projects, this fact alone pays off. This is achieved thanks to optimized interaction between the new valve technology and hydraulic switching concepts. Service access has been substantially improved by the new click function of the cover for the most important hydraulic components. Moreover, the new cover is also soundproof and reduces noise emissions by 30 percent. This not only creates pleasant working conditions, but also makes it possible to mesh injection molding production and assembly workstations closely together.

Best consumption values: Drive, oil volume, adapter for the injection unit

Less electricity, less oil, fewer masterbatches. The new CX conserves all consumable materials. The drive concept has been energy-optimized and requires ten percent less electricity than before thanks to smart battery management with a disconnectible battery. The BluePower Vario drive option can do even more: a variable-speed asynchronous motor improves efficiency and reduces idling capacity. The longer the cycle times, the greater the savings of up to 30 percent compared to the traditional hydraulic variant.

We put effort into reducing oil volume by 20 percent due to high oil prices. This was achieved through fine filtering and oil treatment with an eye toward conservation during preheating. In addition, the service life of the oil is increased by up to 40 percent, reducing how often changes are needed. Customers benefit from a lower investment for initial filling and oil changes.

The majority of injection molders are familiar with the problem: a small part is to be manufactured and the minimum material throughput of the available machine is too high. The only workaround is to use a large sprue, wasting resources in the process. This is why the plasticizing unit of the CX series features adapters that enable the machine to be adjusted for smaller shot weights. The tried-and-true high-performance screw also conserves material. Its good homogenization performance means that the color masterbatch amount can be reduced by up to 30 percent, which – at prices as high as 20 euros per kilogram – easily adds up to a few thousand euros per year.
AHEAD: How exactly does APC work?

Dr. Schiffers: APC detects changes in the viscosity of the plastic melt online in each cycle. Based on this and other definitive factors, the control system then calculates the respective optimum injection parameters from shot to shot. The most relevant aspects here are the changeover point between the injection phase and holding pressure phase as well as the holding pressure profile.

AHEAD: What is the advantage for the user?

Dr. Schiffers: This achieves extraordinarily high consistency in shot weight – and in part quality as a result. For a radio bezel with a shot weight of about 150 g, there was no trouble achieving a Cpk process capability index of 2.0 with APC – all with specification limits reduced by 1/3. The process capability index is a mathematical statistical key performance indicator for evaluating how accurately and, above all, how consistently parts meet quality criteria. A Cpk value of 1 corresponds to just under 3,000 defective parts per one million parts. A Cpk value of 1.5 means fewer than 10 defective parts per one million! Delivery quality is achieved very quickly when starting up systems with APC as well. The process becomes more robust on the whole in the face of disruptive effects and requires less user intervention and fewer checks.

AHEAD: Is APC available only for new machines or can it be retrofitted?

Dr. Schiffers: We now offer APC for all new and existing (MC5) machines from KraussMaffei. Retrofitting is certainly an option; we’ve done this quite a few times on existing customer machines as part of field tests. Feedback from our customers has been extremely positive. There were significant improvements to process consistency and, in many cases, a clear reduction in scrap.

Fluctuations in properties among individual raw material batches, changing portions of recycled materials and processing time fluctuations for semi-automatic manufacturing, factors such as these influence the viscosity of the plastic melt and the quality of the parts as a result. By their very nature, KraussMaffei machines provide the best conditions for stable processes and increase process reliability even further with the new APC (Adaptive Process Control) function. AHEAD discussed this topic with Dr. Reinhard Schiffers, Head of Machine Technology.
MOBILE AUTOMATION CELL ON MULTIPLE INJECTION MOLDING MACHINES

THE ROBOTS GET ON A ROLL

Flexibility is a property that is in high demand in plastics processing. Now another solution is joining the numerous intelligent solutions that KraussMaffei offers its customers: A mobile automation cell that enables use of the handling robot right where it is needed.

TEXT: JOACHIM WEBER  PHOTOS: KRAUSSMAFFEI

Up until now, every injection molding machine with an occasional need for automation has been permanently equipped with a complete set of robot peripherals. This tied up valuable capital, even when the machine or automation was not needed at all. As of now, this is something that can be avoided. KraussMaffei is solving this problem with a mobile automation cell that can be moved from one machine to another with ease. Currently, this cell is designed for injection molding machines of the same design with clamping forces from 35 to 160 t.

The heart of the cell features a high working speed
It contains everything needed for efficient product handling. The core of the machine is a small robot from the Kuka-Agilus series, with a payload of 6 kg and a range of 900 mm. The main feature of this industrial robot is a high working speed and equally high precision. The robot removes the finished parts from the mold and deposits them on a conveyor belt. The belt features a length of 1,500 mm and a width of 400 mm and is part of the basic equipment. Quality control is taken care of by a QA container, into which the operator can discharge parts to inspect them at any time by pressing a button without stopping production.

The integration of robot cells into the machine control system is a particularly appealing option. As with a permanently installed pendant, the injection molding machine can also be operated via the robot control system’s handheld device. This works in the opposite direction as well; the operator can control the automation cell via the MC6 control system of the machine. Thanks to the VisuX and ProgTechX software packets included in the standard version, the robot is very easy to operate and program.

The cell can be mechanically connected to the injection molding machine by a docking bracket. The electrical connections are made using modular connectors. Plug and play allows you to make the connections in a few steps. The low amount of effort this takes also
PLUG AND PLAY
The mobile cell can be quickly and easily docked in just a few steps and used on injection molding machines that have a clamping force of 35 to 160 t.

benefits the operator. The sophisticated mechanical docking system ensures that once the program sequence for the robot is created, it can be repeated with high accuracy on the respective machine even after being docked and undocked many times. Teaching the removal point again is no longer necessary for most applications, as demonstrated in repeated testing. When using multiple robot programs, the program can be changed in a matter of minutes. The added flexibility also significantly reduces set-up times.

Changing the physical location of the automation cell is just as easy. The basic body of the cell consists of a stable steel frame and is set on guide rollers. They enable the operator to shift the unit easily from one machine to another despite its weight of approximately 1,100 kg. However, two guide rails under the cell also make it possible to use forklifts or cranes.

Compact design for increased flexibility
As soon as the cell is correctly positioned at the injection molding machine, it is docked using quick-release fasteners. Adjustable feet can be unscrewed and extended by hand, providing additional support. A compact enclosure closed at the top with stable polycarbonate viewing windows makes it possible for the operator to look into the cell and ensures the necessary safety. The frame features a width of 2,200 mm, a depth of 1,200 mm and a height of 2,200 mm, allowing the compact design to save an abundance of valuable production space.

This flexibility tool itself also provides a wealth of flexibility – the standard version simply provides a functional, low-cost frame for you to work from. Almost all parameters and components can be changed. Having other robot and conveyor belt types or other robot installation positions within the cell is also an option.

A reject container for bad parts can also be integrated, as can additional peripheral modules, such as testing systems, assembly stations, preparation units for insertion parts or detaching stations. And if the options for a single automation cell are insufficient, multiple cells can be coupled together to provide the necessary range of automation technologies for an injection molding machine. The mobile automation cell gives your imagination almost limitless freedom.

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WIDE PROCESSING WINDOW, HIGH MIXING QUALITY AND LOW MAINTENANCE

VARIO NOZZLE SETS
NEW STANDARDS

The processing of polyurethane (PUR) for automotive seat cushions with different firmness zones places particular requirements on the nozzle technology. With very variable discharge capacities, the nozzle has to keep pressure ratios as constant as possible. And not only that. The new Vario nozzle from KraussMaffei solves many problems at once.

TEXT: JOACHIM WEBER  PHOTOS: KRAUSSMAFFEI
Another illustration of the flexibility of systems for processing plastics: To manufacture multi-hardness products from PUR with different output rates and molds on one system, you need a wide processing window for shot weights and quantity flows. Automotive seats provide a notable example. They generally consist of zones of different hardness. Usually the seat and back surfaces are soft, while the side parts need more rigidity to provide the occupants with more support.

This means that when foaming the various component areas, the output rate of the PUR components changes from shot to shot. In order to avoid a loss of quality, pressure differences from these fast and very substantial quantity changes must be kept as close to zero as possible. The mixing head provides the solution; the nozzle has to compensate for these changes.

**Alternative to the spring-loaded nozzle**

This has been extremely successful to date using spring-loaded nozzles. They use a spring connected to the nozzle needle to adjust the nozzle gap. This makes it possible to manage quantity changes up to a ratio of about 1:3 without extreme pressure changes. However, one disadvantage of the spring system is the moving seals, which are subject to wear and tear from static friction and sensitive to more corrosive media and dirt. Moreover, in certain cases the spring and nozzle needle system can begin vibrating.

These weaknesses have been thoroughly resolved with a new development: the KraussMaffei Vario nozzle. Instead of a spring, it operates with a pressure cushion, which counteracts the component pressure. This air cushion has approximately 160 bar of pressure and sits in a gas compartment in the rear part of the nozzle. It acts upon the nozzle needle via a membrane, eliminating the need for moving seals.

**Constant mixing pressure**

The Vario nozzle provides the processor with a whole range of benefits. Foremost is high flexibility in the system assignment with large and small components, which require correspondingly large and small discharge capacities. This adaptability is made possible by the large adjustment range – the nozzle keeps the pressure in the mixing head constant up to a quantity ratio of 1:5. This way it ensures high mixing quality and a constant mixture ratio.

The pressure curves in shot mode (see graphic) impressively illustrate the difference between Vario and spring-loaded nozzles. During the process, the Vario nozzle also features high repeatability and excellent consistency in pressure and quantity.

The design free of moving seals reduces cleaning and maintenance expenses compared to conventional designs. This is because sticking and jamming of the needles is now a thing of the past. And the notorious needle vibrations – even when working with isocyanate – no longer occur. Thanks to its compact dimensions, the new Vario nozzle is easy and inexpensive to retrofit into existing systems. This requires neither additional control elements nor any changes to the control system. The Vario nozzle is compatible with KraussMaffei mixing heads and systems.

Its fields of application extend well beyond soft foam applications. It has also already proven itself in the realm of major appliances – such as inserting the insulating layers of refrigerators – and when manufacturing fiber-reinforced parts with resin transfer molding (RTM). Feedback from users in every area has been unanimously positive. The application engineer from one seat cushion manufacturer calls the Vario nozzle “one of the best developments in the last five years.”
Multiple colors, hard-soft combinations with different plastics and metals, packaging with finished decorative trim – multi-component injection molding opens up a wide range of design options for the user. KraussMaffei has a solution ready for nearly every task – a customized multinject machine.

TEXT: JOACHIM WEBER  PHOTOS: KRAUSSMAFFEI

Every driver turns the air vent thumbwheel on the dashboard now and then. The part moves easily, feels good to the touch, but is otherwise completely inconspicuous. And yet there is quite a bit of expertise hidden in the part. A hard polycarbonate core ensures the component lasts and transmits the force to the adjusting mechanism. And a coating of soft thermoplastic elastomer ensures that your finger does not slip off.

The thumbwheel represents a typical multi-component product manufactured on an injection molding machine in a single pass. Different materials – as well as different functions as a result – are combined in the mold made by Dr. Schneider. This takes place in machines such as the new version of the CX series from KraussMaffei, which was on display at the Fakuma 2014 trade show. The highlights of this machine include the new energy-efficient BluePower drive, reduced oil volume and a faster clamping unit. Along with its compact design, the CX represents an excellent and cost-effective solution for integrating technologies such as multi-component technology.

Aside from the second injection unit, the especially noticeable feature on this Fakuma machine is the mobile automation cell. This Agilus cell is a mobile unit with an integrated industrial robot and conveyor belt; the unit is also firmly connected to the machine. Sophisticated interfaces enable you to easily dock onto various injection molding machines – with full mutual access to the control system for machine and robot. This makes it ideally suited for multi-component technology.

**Solutions in the mid-size machine segment**

The GX series for clamping forces from 400 to 900 t offers the multi-component injection molder numerous options in the mid-size machine segment. The horizontal version (GXH), which has two adjacent injection units, is ideally suited for processes such as packaging-related applications. The best-suited products are complex multi-component closures, such as multicolored flip-top caps for shampoo bottles. The basis for this is the high speed of the GXH, the low energy consumption and the performance with extremely compact and low design in addition to easy integration of a linear robot. The horizontal position of the injection units prevents robot collisions and provides perfect accessibility at all times.

As a leading technology provider, KraussMaffei is constantly capturing new markets in this segment with the GXW SpinForm reversing plate machine. The next generation multi-component injection molding was introduced at the K 2013 trade show using the ColorForm process – in close collaboration with the polycarbonate manufacturer Bayer, the coating manufacturer Panadur, the mold maker Hofmann, and Weidmann.

The demonstration part consisted of a thermoplastic housing layered with different coatings in the ColorForm process, while light was applied at the same time. The final product was a component with two different colors and three sharply delineated surface effects: high gloss, depth and structure. “That was integration at the highest level,” says Jochen Mitzler, Head of Strategic Product Management for KraussMaffei, in retrospect. “But it is just the beginning of a new era.
in multi-component injection molding. The next step of multi-component technology is the ‘genuine’ functionalization of plastic components with metal alloys.”

KraussMaffei showcased precisely what this means at the Fakuma 2012 trade show: a fully “wired” and functional design LED lamp made of plastic created in one work process in an injection molding machine. It was the result of cooperation with the Institute of Plastics Processing at RWTH Aachen University and Krallmann GmbH, which developed a procedure for injecting low melting metal alloys. Integrated into a CX multi-component injection molding machine, complex strip conductors were sprayed directly onto a plastic carrier and enclosed and insulated with another layer of plastic. At the Fakuma 2014 trade show, KraussMaffei demonstrated integrated plastic-metal injection molding, abbreviated as IMKS in German, on a CX80. The component illustrates the design possibilities of the technology based on a “switch and rocker function.” The procedure opens up new options for designers to optimally functionalize multi-component parts. For example, the low melting point enables contact with LEDs to be established right when doing the injection molding. Then there is no need for additional soldering and wiring in a separate working step.

“New materials are integrated during integrated plastic-metal injection molding, and this ‘genuinely’ functionalizes the component in just one process step. This is quite clearly where the future of multi-component technology lies,” says Mitzler. “The high productivity and cost-effectiveness of the integrated plastic-metal injection molding process makes it possible to produce large numbers of advanced components even in high-wage countries. KraussMaffei’s technical advantage stems from continuous development from dialogs and networking with our customers and partners.”
INDEX PLATES
Electrically driven index drive – placement behind the ejector plate saves space.
The Texen Group (Groupe Texen), one of the largest global manufacturers of plastic packaging for cosmetic and perfume products, recently commissioned a KraussMaffei injection molding machine. This multi-component machine from the CX series is equipped with many refined procedural and mechanical features, which increase its flexibility in the development of injection molded packaging.

KraussMaffei received a milestone order in the French market. One of the leading international manufacturers of plastic cosmetic packaging recently started producing innovative plastic packaging for premium quality cosmetics and perfume using a CXZ 160–380/180 hybrid. With sales of nearly 170 million euros in the last fiscal year and almost 1,000 employees, Groupe Texen is one of the largest companies in this market segment. The company manufactures injection-molded plastic packaging and screw-cap closures at eight locations in Europe, North America and Latin America. "Texen was looking for a partner who could deliver an injection molding machine with outstanding application flexibility." In this respect, the requirements of the performance specifications were extremely demanding. "We have integrated all kinds of process engineering, which likely cannot be found in France or even in the market as a whole in this form," explains Jacques Socquet, President of the subsidiary of the KraussMaffei Group in France.

CX machine with extensive equipment and automation

Texen opted for a two-component injection molding machine from the CX series, a CXZ 160–380/180, with a LRX-100 side-entry robot, a decision that resulted from constructive discussions with KraussMaffei sales, product and process experts from France and Germany. Fabrice Baravaglio, President of Texen, adds: "As a part of our strategy program 'Ambition 2020,' PSB Industries, the parent company of Texen, is focusing on the expansion of R&D activities. The new innovation center 'Texen Lab' was also established within this framework. Our new injection molding machine is utilized specifically for development projects. We envisioned a single machine that could map all of our requirements." KraussMaffei succeeded in making our vision a reality. Consequently, Texen acquired a CX Hybrid with 1,600 kN of clamping force and an extensive equipment package. The CX Hybrid series combines the benefits of a fully hydraulic clamping unit with those of electrically driven injection units. This series is characterized by low energy consumption and high power density. Each shaft of the injection unit is electrically driven separately so that the mold can be opened and the ejector activated, even during the plasticizing phase. Shot weights up to about 140 g of polystyrene can be produced with the large injection unit. The machine is also designed for the injection of multi-component parts using a sandwiching technique and is equipped for molds in index implementation. Furthermore, physical foaming (MuCell) is possible with all components. It also comes equipped with control system interfaces for essential processes for achieving high-end surfaces, such as in-mold decoration, SkinForm/ColorForm, DecoForm or CoverForm. The Dynamic Mold Heating (DMH) system from KraussMaffei is an integral part of these technologies. It separates the temperature control circuits in molds and creates a dynamic temperature profile in the mold. This innovation minimizes the masses in need of heat-balancing in the mold-halves and does not allow the mixing of the heating fluid with the coolant, which ensures effective operation of the system. Furthermore, the machine is equipped with interfaces for gas injection technology and the processing of liquid silicone (LSR).
Clearing the way for sustainable mobility: Electric cars, including the BMW i3, can take full advantage of the benefits of KraussMaffei plastics expertise. Exterior parts made of thermoplastics and structural components made of fiber-reinforced plastic are produced in injection molding and reaction process machines of the world’s leading machine manufacturer.

High pressure, precision and passion for sustainable mobility

Electromobility holds out the promise of greater environmental compatibility due to lower fuel consumption and fewer exhaust emissions. However, these advantages can only be attained with the alternative drive unit of the much heavier electric battery that has to be compensated through the lightweight construction of the vehicle. As the first supplier of production equipment and with the aid of refined processes, KraussMaffei is helping to process carbon fiber-reinforced plastics (CRP) for the first time in series production. This is being achieved with premium quality injection molding machines in swivel plate technology and the mature high-pressure resin transfer molding process (HP-RTM). "That is our contribution to a new generation of vehicles in order to facilitate the breakthrough of lightweight construction and electromobility," said Nicolas Beyl, Managing President of the Reaction Process Machinery Segment of KraussMaffei.

For very high dimensional accuracy of the parts
KraussMaffei has supplied BMW with premium quality injection molding and reaction process machines, for example two double swivel plate machines, which are fully automated with two industrial robots. Weighing 400 t, each MX 4000-17200/12000/750 WL is 24 m long, 9 m wide and 7 m high. The thermoplastic outer shells of the i3 are...
UNDER HIGH PRESSURE

With the newly developed reaction process machinery mixing head from KraussMaffei, internal release agents can be metered. The improved HP-RTM process permits cycle times which are reduced from up to 24 hours to minutes depending on the complexity and size of the component.

produced on these machines, which have a clamping force of 4,000 t, at the BMW plant in Leipzig. Using the “joining in injection molding” process, the outer door shell and its substructure are injected in a single pass, are joined as the two swivel plates turn and are bonded with a third plastic component. “The combined work processes ensure very high dimensional accuracy of the parts,” said Frank Peters, Vice President Sales of the KraussMaffei brand.

The “face” of the i3
In addition to the sidewall panels and the rear bumper, the hood of the BMW i3 comes from a KraussMaffei injection molding machine. “These are produced on the most complex systems we have developed to date,” says Peters. “With great dedication, we met the challenge of contributing cutting-edge machine technology that places the most stringent requirements on availability. I’m proud of what our team has accomplished.”

High filling pressures for optimum fiber wetting
In addition to injection molding technologies and automation solutions, the Reaction Process Machinery Segment is involved in the BMW i3. Twenty machines for high-pressure resin transfer molding (HP-RTM) supply reactive resin components for the supporting structures, for example the side frame, at the BMW plants in Leipzig and Landshut. HP-RTM allows fast-reacting resin systems to be processed in order to attain short cycle times. High-pressure injection produces a high degree of fiber wetting. A ten-man team from the KraussMaffei Reaction Process Machinery Segment set out to improve metering technology and provide mixing heads with the possibility of adding an internal separating agent. The experts worked under high pressure to meet the specific requirements relating to chemistry and the process. “We are now the only manufacturer of metering machines on the market who has this experience under series conditions,” said Beyl.

Stiff lightness
In order to produce fiber-reinforced parts with an epoxy matrix in larger series, KraussMaffei enhanced high-pressure resin transfer molding (HP-RTM) for series use. In this process, a self-cleaning, high-pressure mixing head injects the resin into the closed cavity and saturates the fibers inside under high pressure and with precise stipulations of the duration and temperature so that the resin and hardener are fully networked. After it has hardened, the component becomes stiff and very light. Compared with the previous autoclave process or vacuum infusion, the advantage of automated production is that the cycle times are reduced from up to 24 hours to minutes, depending on the complexity and size of the component.

Another advantage is that this type of HP-RTM process is also suitable for the use of polyurethane instead of epoxy resin as a matrix material. In addition to its easier handling and typically lower-priced raw material, polyurethane offers the benefit of a lower processing temperature.

Competitive edge for the mega trend of electromobility
Coordination was critical to mastering the vast number of continuously recurring individual questions, specificiations and deadlines. “This complexity could only be mastered by our experienced team and through close cooperation with the technology experts from BMW and other partners in the areas of compression molding, mold-making, handling and automation,” emphasized Erich Fries, Head of the Composites Business Unit at KraussMaffei. Many years of experience in this field were also required. For example, the Reaction Process Machinery Segment of KraussMaffei has been refining its range of fiber composite technologies since the 1990s, initially for utility vehicles in particular and lately, to an increasing extent, for car manufacturers. “With the BMW i3, we implemented our improved HP-RTM technology for the first time under series conditions within the context of a completely new production concept. This provides us with a broader view of the process chain in efficient fiber composite production and is our competitive edge for other projects,” summarized Josef Renkl, Head of Research, Development and Application Technology. Beyl added: “This lightweight car is therefore the vehicle for the megatrend of electromobility.” So that a large number of them can glide smoothly and quietly along roads in future without any emissions.
PARTNERS FOR A DECADE: ROSIŃSKI PACKAGING AND KRAUSSMAFFEI

CUSTOM TAILORING AND SERVICE ARE THE DECISIVE FACTORS

It is rare for a manufacturer of blow molded bottles to also produce screw-cap closures via injection molding. Rosiński Packaging, founded in 1981 in the southern Polish town of Bielsko-Biała, does both. The company processes approximately 20,000 t of plastic annually on nearly 40 blow molding machines and a total of almost 50 injection molding machines.

TEXT: SIMONE WERNER, URSULA STEINER  PHOTOS: ROSIŃSKI PACKAGING

Plastic screw-cap closures are mass produced. Fifty injection molding machines are in use 24/7 at the Rosiński Packaging plant. Their output is screw-cap closures and covers for containers, to be filled with household chemicals, cosmetic products and foodstuffs. Each year 600 million covers and screw-cap closures leave the company, using the company's own fleet. The projected number of pieces for 2014 is 650 million.

At this magnitude, the injection molding system is fully utilized. Rosiński Packaging thus opened a second production facility for 40 injection molding machines in mid-2014. This facility will be certified in accordance with ISO 9001:2008, ISO 14001:2004 and ISO 22000:2006, as well as EN 15593. The directive applies primarily to the production of primary packaging with direct contact to foodstuffs.

The first machines for the new hall have already been ordered: a total of eight machines in the GX series, the first GX machines for this customer, and 2 CXZ machines for multi-component applications. "The injection molding machines of the GX series have impressed us with their low energy consumption, state-of-the-art hydraulic system, short cycle times, excellent precision and compact design. As we work with large molds with many cavities, the platen-parallel friction lock was a particularly important criterion of the buying decision. We have high expectations for the new machines," explains Marcin Rosiński, General Project Manager and one of company founder Andrzej Rosiński’s two sons, who are on the Board of Directors.

Manfred Schulz, International Sales Manager at KraussMaffei in Munich and responsible for the Polish market, explains that, "After the customer has already successfully operated many of our fully hydraulic machines, we are particularly pleased that it has now decided on the new GX series. Based on the performance data, with a clamping force range of 400 to 650 t, this series is also ideally suited for the packaging sector with high-speed products."

Customized production solutions and excellent service

Since the start of collaboration just over ten years ago, both companies have developed a strong partnership. The first CX injection molding machines with 1,300 and 1,600 kN clamping force, which were supplied by KraussMaffei in 2006, replaced older, smaller and less powerful injection units of other manufacturers. Over the years, approximately 30 more machines have been added, with clamping force ranges between 2,000 and 6,500 kN. Rosiński has been buying its injection molding machines exclusively from KraussMaffei for eight years.

Rosiński Packaging has also recently invested in multi-component technology. A total of six CX machines with clamping forces between 2,500 and 3,500 kN will be used for both multicolored and rigid-flexible combinations. An additional 2-component machine with 4,200 kN clamping force has already been shipped.

It was apparent in the early 2000s that Rosiński Packaging would grow rapidly and the owner family would require a strong and innovative partner. In doing so, it was especially important that the machine supplier was capable of adapting the injection molding machines to in-house specifications. Due to relatively low shot weights being used for large-format molds with up to 48 cavities, one of the objectives was to expand the large mold installation space by enlarging the distance...
between tie bars. It simplifies access to the mold area simultaneously – an important result because Rosiński averages approximately 140 mold changes per month.

In addition, precision is a very important factor: precision in the closing movement and locking force, as well as the precise and metering of the processed raw materials. Another important consideration for Rosiński Packaging is the compact design of the injection molding machines, which allows optimal use of available production space. The wide range of options offered for the fully hydraulic machines is also essential for successful longtime collaboration, making it possible to respond quickly to changing market and customer demands.

"Choosing KraussMaffei as the supplier for our injection molding machines was one of the best strategic decisions we have ever made," says Marcin Rosiński. His brother Michał adds: "We are extremely pleased, not only with the machine and process technology expertise at the Munich headquarters, but also with the support service at Dopak, the Polish agency of KraussMaffei. The employees are highly skilled, response time is short and we receive documentation that is in our language and easy to understand. This includes everything from the quotation to the machine documentation. Of course, the control software is also available in Polish."

**Comprehensive product range for global customers**
Rosiński Packaging’s customer base includes the majority of Europe’s leading providers for household chemicals, detergents and cosmetics. In order to meet their strict quality specifications, the company regularly invests in new machine technology. The majority of the injection molding machines are automated, some with robots. Rosiński also develops and produces proprietary handling and peripheral devices that are custom-designed for their respective applications.

An additional important pillar and guarantee for exceptional finished product quality is the in-house mold making. For seamless quality monitoring and documentation, a wide variety of test equipment for quality assurance is also available in the goods receiving area and in final inspection before shipping.

Michał Rosiński adds: "We have recently developed into an all-inclusive service provider for our customers. If necessary, we are capable of providing everything from product design for bottles and screw-cap closures to finished, installed bottle/screw-cap closure combinations. In the foreseeable future, our company will be able to implement screen printing, produce sleeves and carry out in-mold labeling processes. That is a critical competitive advantage for us."

**KraussMaffei and Rosiński – years of shared success**
"We are very proud to be a part of this success story," says Manfred Schulz. "This kind of long-term collaboration, which results in success for both parties, doesn’t come along every day. Of course, our Polish agency Dopak is a significant part of our success."

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**SPECIALIST**
Rosiński Packaging is a manufacturer of PP and PE packaging for the household chemical, cosmetic and foodstuffs industries.
KraussMaffei has been holding one-day customer symposiums on injection molding machinery since 2006 – with great success. Markus Bauer, Service Manager at KraussMaffei in the Injection Molding Machinery division, explains: “At these events, our service experts provide useful tips and practical information. This makes it easier for machine operators and maintenance personnel to attain greater efficiency and predictability in operating their injection molding machines. Participants can put what they learn into practice straight away and optimize the settings on their machines.” Particular attention is paid to the issues of energy saving, mold protection, the wear resistance of plasticizing units and robot maintenance.

**From preventive to condition-based maintenance**

The intelligent transition from preventive to condition-based maintenance saves customers time and money, and increases the availability of their machines. The service symposiums present the most frequent causes of wear-related damage on injection molding machines and automation systems, describing wear-prevention measures and allowing participants to share their practical experiences. Selecting the right hydraulic oil to use and the challenges of oil filtration are of the utmost importance in this regard, as is caring for the coolant in order to protect the cooling circuits and the molds – and thus preventing the formation of rust, limescale or microbiological contamination in heat exchangers and molds. How to choose the right processing unit based on the materials to be processed and analyzing the damage patterns on screws and cylinders are also key topics of discussion.

**Making use of potential energy savings**

There are many ways to save energy in the injection molding process. During the service symposiums, KraussMaffei experts demonstrate the potential energy savings that can be made with injection molding machines and automation technology, providing ratios to assess their energy consumption and taking a look at integral solutions. Successful practical examples as part of the introduction of the ISO 50001 standard and comparisons between the energy consumption of various different machine concepts are also given.

KraussMaffei’s servicing and maintenance concept has proved itself when put into practice at a number of companies. “Running the injection molding process as efficiently as possible generally requires more than just optimizing individual injection units or turning a couple of adjuster screws here and there. We are able to analyze and optimize complete systems – the machine, mold, automation system and peripheral devices – not only in their entirety but also in terms of interoperability. This is where the biggest differences are made,” affirms Bauer.
The hybrid design with continuous-fiber-reinforced polyamide composites reduces weight considerably in lightweight construction of automobiles. This is shown by a production-ready infotainment mount developed by AUDI AG, LANXESS Germany AG and Christian Karl Siebenwurst GmbH & Co. KG, together with KraussMaffei Technologies GmbH. "The prototype is just over half the weight of comparable steel components, is easier to install and is suited to being manufactured in a large-scale production process," said Anja Jäschke of AUDI AG at the "Plastics in Automotive engineering" conference in Mannheim. And this has been a success; the infotainment mount has been part of the A6 platform series since May 2014.

The component is created in a one-shot process in a single mold. KraussMaffei succeeded in developing a production cell that enables fully automated production of the infotainment mount in a cycle time of less than 60 seconds. To achieve this task, the FiberForm procedure developed by KraussMaffei was implemented, a multifunctional processing method that combines injection molding with the thermoforming of composite sheets. The advantage is that the strength level of fiber-reinforced plastic parts is increased through this procedure. It involves the use of two inserts made of Tepex dynalite 102-RG600[2]/47%, a polyamide 6 composite from LANXESS, reinforced with continuous glass fiber. They are gently heated with infrared heating, formed in the injection mold and then directly over-packed with the easy-flow polyamide 6 Durethan BKV 30 EF H2.0 from LANXESS. "This allows the implementation of additional stiffening in the form of ribs and the integration of additional functions. Since production fits seamlessly into an injection molding operation, the process is ideal for mass manufacturing lightweight structural components," explains Martin Würtele, Head of Technology Development KraussMaffei.

High level of automation
A linear robot, equipped with a special gripper, handles the heated composite inserts in an extremely reproducible sequence despite the very short transfer times. The mold was engineered and designed by Siebenwurst. Special retaining pins precisely position the heated inserts in the mold. The holes for the screw connections are pierced after forming to preserve the fabric, in other words they are not punched in a subsequent step. As a result, the glass fibers in the composite inserts are not cut, but rather pushed aside optimally so that the mechanical properties of the highly stressed region around the connection points remain intact, or in some cases are even improved.

Furthermore, additional refined technical features optimize the FiberForm procedure for this specific application. This enables adaptation of the software for uses such as feeding the clamping unit during retracted automation and grippers. This significantly reduces the cycle times. In the area of automation, KraussMaffei has also proven to be a reliable system provider. Therefore, the Munich-based specialists developed and supplied the complete automation system, including the infrared heated area. The KraussMaffei machine controls and monitors the heated area and is therefore fully integrated into the injection machine control system. "The heated infrared area is arranged above the clamping unit. This reduces transfer time between heating up the composite sheet and over-molding in the mold," explains Würtele.

The infotainment mount is installed in the A6 platform series.

FIT FOR LARGE SERIES

The new infotainment mount prototype, made of continuous-fiber-reinforced polyamide composites from Audi, is not only extremely lightweight. Thanks to the fully automated FiberForm production cell from KraussMaffei, short cycle times of less than 60 seconds are possible.

TEXT: PETRA REHMET PHOTOS: LANXESS, AUDI AG
AHEAD: What makes the Ontario location interesting for you?
Würtele: The proximity to the North American industrial region. Above all the automotive industry based in nearby Detroit. This branch of the industry currently has a large need for customized lightweight construction solutions, which makes the industry an enormous driver of technology in North America. In addition, we also have a research location at the University of Toronto. There we have an MPML (Microcellular Plastics Manufacturing Laboratory) and an injection molding compounding installed by KraussMaffei, which is being used to research physical foaming in direct compounding.

AHEAD: Which goal or customer group in Canada is KraussMaffei focused on?
Würtele: Currently, the automotive and aviation industries are the driving forces in lightweight construction. They are looking for suitable technologies for the small and for the large series. At FPC, suitable systems and process solutions are available on-site for both tasks, from resin transfer molding via compression molding with material flow to injection molding technology. In addition to the traffic and transportation sectors, there are additional attractive target/customer groups in mechanical engineering, electrical systems, the electronics industry and the consumer/sports industries.

AHEAD: What convinced you to get involved with FPC?
Würtele: We should mention here that we are nurturing a long-term collaboration with ICT in Pfinztal and are also working together in the area of reaction process machinery with Dieffenbacher, which is also very present in FPC. Incidentally we are very open: with this kind of flagship project, which also reaches the USA, we hope to gain easier access to the American market. After all, this center of expertise is located much more conveniently for potential users than our Tech-Centers in Germany. We also know that American automotive suppliers and other plastics processors prefer hands-on testing of new product and procedural solutions. The FPC offers the entire spectrum of technical possibilities, for ourselves and our associates, in a single location. An invaluable advantage.

AHEAD: Western University intends FPC to make London, Ontario, the leading center for composite materials research in North America. From the perspective of the sober-minded engineer: Is this too lofty a goal?
Würtele: FPC already has the prerequisites in place and the signs are very favorable. Mechanical and systems engineering, as well as the collaboration with ICT and Western University, enable a holistic view of the subject of lightweight construction. It is important that FPC is a neutral, not-for-profit institution, affiliated with the university as a research and development center. Therefore, business partners as well as processors can make use of the TechCenter for their own research and development.

AHEAD: In your opinion, how great is the current interest in lightweight construction technologies in the North American market? Is it only coming from pioneering industries?
Würtele: We have noticed a substantial increase in interest for special injection molding technology processes, both in the lightweight construction field and for premium-quality surfaces. Currently, the demand is limited primarily to the automotive industry, which is the classic engine of innovation and technology.

AHEAD: What does KraussMaffei’s contribution to FPC look like?
Würtele: It is a complete package that allows us to present two of KraussMaffei’s lightweight construction technologies. In addition to a dosing unit for HP-RTM technology, it also has a MX 1600-12000 injection molding machine with an IR900 industrial robot from KUKA, a fully equipped MuCell for the foaming of thermoplastics and a
AHEAD: Can you briefly summarize the FiberForm approach?

Würtele: During the FiberForm process, fabric made of continuous fibers is first heated in a thermoplastic matrix, then reformed in the injection mold, and finally back-injected. FiberForm combines the thermoforming of composite sheets with injection molding. Through this process we can further increase the strength of fiber-reinforced plastic parts. This opens up infinite possibilities for function integration and part design, since FiberForm can be combined with almost all special processes (for example MuCell). In some examples additional stiffening, such as ribs, can further increase stability. Examples of products are seat shells, instrument panel supports, box covers, side impact protection components and technical parts in the engine bay.

AHEAD: Fiber composite processes have the reputation of being relatively slow and thus not suitable for series production. What is the outlook for FiberForm?

Würtele: This is exactly where the combination of thermoforming and injection molding shows its strength. With cycle times of less than 60 seconds, FiberForm fits into almost any mass production line. Even more so because the procedure can be easily automated. With reliable, reproducible and fully automatic manufacturing processes, it creates components with final contours and no post-processing required. As production fits seamlessly in an injection molding operation, the process is excellent for manufacturing lightweight structural components in large series.

Thank you for speaking with us, Mr. Würtele!
Some 3.5 million vehicles per year make the host of the World Cup in 2014 the seventh-largest manufacturer of automobiles now, and by 2020 this number should rise to 4.5 million. The VW Golf has been the best-selling vehicle for a long time, and the premium brands BMW and Audi are also currently erecting plants where best-selling models like the Series 1 and 3 or the A3 will be developed in the future. For injection molding and reaction technology applications from Krauss-Maffei, the focal point of sales is the automotive industry, but the requirements here often differ from those in Europe. While high-tech solutions such as processing of carbon fibers can be marketed here in Europe, the automotive sector in Brazil is extremely price-driven. As the standard of living rises, however, standards are also growing, for example, for the design of surfaces, and even more complex production plants will be required. Then the competitive edge of expertise from the collaboration with OEMs and suppliers is of great benefit.

Oppportunities for growth in the consumer goods and medical industry

In addition to cars, which are classified as durable goods, the consumer sector in South America also offers many opportunities; foremost here are the beverage, packaging and medical industries. The coupled with higher purchasing power is leading to the demand for packaging for water and carbonated soft drinks. In South America, the market for filled and packaged beverages amounts to an estimated 160 billion liters – and market researchers predict annual growth of four percent by 2016.

Constant demand from the construction industry

Activity in the field of extrusion is benefiting from the continuous population growth in Brazil, a country with 200 million inhabitants and a growing need for infrastructure for building construction and underground construction. At the same time, the production of PVC pipes for transporting drinking water or for drainage has a long tradition there, and the KraussMaffei Berstorff brand is established among all large pipe manufacturers. Of course, the country also poses challenges – such as pronounced bureaucracy, unequal education opportunities and infrastructure that needs improvement. Nevertheless, Brazil is the most important market in South America for the KraussMaffei Group. Klaus Jell emphasizes, “We are glad that European and American customers are settling here, which results in the level of quality rising even more. We want to use the opportunities in growing business units such as medical technology for the long term.”
THREE STRONG BRANDS IN NORTH AND CENTRAL AMERICA

The KraussMaffei Group reinforces sales and service worldwide. The customers in numerous regions and countries benefit from more efficient access to the right contact persons and from an extensive portfolio of solutions and services for the three brands KraussMaffei, KraussMaffei Berstorff and Netstal. In recent months the multi-brand activity from a single source was accelerated in North and Central America.

Paul Caprio, President of the KraussMaffei Group in the US/Canada:

"With the cross-brand approach we have a 360-degree view of all the plastics and rubber processing in North America. Consequently, we can combine solutions from various segments in a unique way. This creates added value for our customers from a wide variety of industries. At our open house in Florence this year we presented the whole process chain from the manufacturing of a granular molding compound to production of an article. Our customers were excited about the expertise packed in our three brands – expertise that only the KraussMaffei Group offers in North America. The excellent customer response at the event and during the year in the course of talking with customers has confirmed our path for us and bolstered our success. We will also continue to actively collaborate with our customers and help them remain at the top of their industry."

Emilio Lopez, Managing Director of the subsidiary in Mexico:

"Our customers in Mexico have responded very positively to the selection from a larger portfolio of electric and hydraulic injection molding machines of the KraussMaffei and Netstal brands. This also confirms that the products of both brands enjoy an excellent reputation. In addition, customers benefit from our immediate service and an excellent supply of automation solutions and innovative process technologies. The option of combining the three processing technologies of injection molding, extrusion and reaction technology under a single roof is unique – and through this we provide significant added value in the market."

Claudia Stadler

Photos: KraussMaffei

Read more!

www.kraussmaffeigroup.us

www.kraussmaffeigroup.mx
The path from a customer’s idea for a product up to the complete production line is often shorter and more efficient than one thinks – if the customer makes use of the expertise and experience of Netstal as a general contractor and system integrator.

Netstal not only builds high-tech injection molding machines, but also provides turnkey systems that have all the system parts integrated. Their scope extends from material processing and feeding, to the injection molding process with subsequent quality inspection, all the way to packaging of the finished product and the hall layout.

Thanks to the close cooperation of Netstal with the suppliers of molds, automation or logistics, all elements are perfectly coordinated from the outset. The customer does not lose any time with either rough or fine tuning of the system. To the extent necessary, all of that is already done at Netstal. Before delivery, the entire line is set up in Näfels, commissioned and released.

This is followed by function, quality and performance tests in real operation, and finally by training of the customer at his or her plant. But cooperation does not end with the delivery. Extensive after-sales services in the form of more training and service offers for process optimization and maintenance round out the complete package.
With rhythmic drumming and a "dragon and lion dance," the KraussMaffei Group celebrated the official opening of its new production factory in Haiyan as part of Chinaplas. In the future, machines and systems of the three strong brands: KraussMaffei, KraussMaffei Berstorff and Netstal brands will be manufactured for customers in China and Asia in this state-of-the-art plant with high European standards of quality. More than 700 guests accepted the invitation and, along with a spectacular Alps Festival, experienced the official ribbon cutting, performed together by the management team of the KraussMaffei Group and the local Chinese politicians.
... you’ll have no trouble with this: the MC6 control system from KraussMaffei

Intuition meets technology
MC6 technology from KraussMaffei sets standards in regard to speed and intuitive operation and makes work easier and more efficient than ever before.

- Everything in view thanks to SplitScreen and ProcessDesigner
- Tap and swipe – just like a smartphone
- Destination reached with just two taps
- Increased energy efficiency thanks to the Eco button
- Machine can be operated through the robot handheld pendant

Engineering Passion