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Technics – Markets – Trends

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Featuring all the best for 2014!

Battenfeld

WITTMANN innovations (Volume 8 – 1/2014)

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Editorial

Michael Wittmann

Dear Reader,

"Black Friday" – until a short time ago, I thought this stood for the beginning of the stock exchange crash of 1929 in the USA. But apparently it is now time to relearn, since the term "Black Friday" seems to have taken on a new meaning in recent years. It has now become a designation for the Friday after Thanksgiving, which marks the beginning of a family reunion weekend – and the start of the Christmas shopping season in the USA. In Austria and Germany, this "Black Friday" roughly coincides with the date when our local Christmas markets open their wooden booths, which are then filled with the aroma of hot chestnuts, fried potatoes and Christmas punch. Certainly a sign that the year is almost over, and an opportunity to reflect about this year, which is now drawing to a close.

Although, as I am writing this, the end of the year is still a whole month away, one thing can certainly be said: for the WITTMANN Group, the year 2013 has no more surprises in store from an economic point of view. In the middle of an extremely varied business environment, we have succeeded in realizing further growth in the Group's sales figures. This seems all the more surprising when considering that, in spite of our international orientation, we realize more than 55% of our sales in Europe. This percentage has not changed over the last few years in spite of rising overall sales. We are very pleased about this, since it is an indicator of our potential for further growth outside Europe. Our business development in North America has been particularly positive in 2013. We recorded above-average growth in the USA, and in Mexico as well. Following a short period of stagnation during the first half of this year, Asia, too, has gathered considerable momentum again and seems to be pressing ahead vigorously towards the coming year. All in all, we look forward to 2014 with optimism and are again expecting genuine growth across all segments of our product portfolio.

This expectation is not only based on our global orientation, but also enhanced by our numerous innovative products. At the recent K 2013 in Düsseldorf, we presented a round dozen of novelties, a clear indicator of our innovative strength and our commitment to further product development to strengthen our customers' competitiveness.

Of course a great amount of work and ingenuity lies behind all of these numerous innovations – which prompts me to take this opportunity to thank all our associates for their dedication, and our business partners as well for the excellent business development in 2013.

Sincerely, Michael Wittmann

Content

Great technology for a small sensor

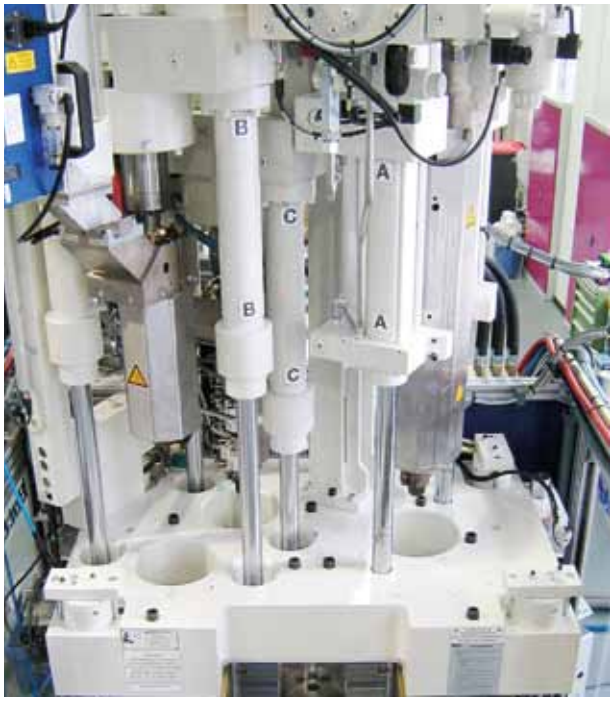
Housing components for sensors in automobiles are the segment in which PROMOTECH, based in Schalchen, Austria, specializes. One example is a combined rain/light/moisture sensor. A vertical 3-component machine from WITTMANN BATTENFELD is used to produce this complex part.

Gabriele Hopf

Every modern car is equipped with an abundance of electronic systems to enhance both its safety and its comfort. Sensors are vital components of such systems. One such sensor is the rain/light/moisture sensor. Its housing incorporates seven infrared rain detectors and two lenses to measure the ambient light level. The housing consists of three different types of polycarbonate. Material number one is crystal-clear PC, used for the two lenses that measure the ambient light (to activate vehicle lighting) and the headlamp light of oncoming traffic (to control automatic dimming).

Material number two is purple PC used to form the seven other lenses (six positioned on the corners of a hexagon, and one further lens used as the hexagon's central lens). These lenses support the emission and reception of infrared light rays. The rays are emitted by an LED lamp on one side, and then reflected by the boundary surface of the windshield to the receiver photodiode positioned on the other side. The infrared light ray, however, is only completely reflected as long as the windshield is dry. As soon as there are rain drops on the windshield, the reflection is disrupted, and only part of the light reaches the receiver diode. The difference in light intensity compared to the degree of light reflection when the windshield is dry controls the function of the windshield wiper.

All the lenses are embedded in a housing made of material number three, a black polycarbonate, with a total weight of less than five grams. Another integral part of the housing is a connector with three insert-molded male contacts. The housings are also connected by means of a "flex band" to a moisture sensor, which detects moisture on the inside of the windshield and activates the blowers accordingly.



The three injection aggregates of the vertical VM 100/210/60/60 R 752 injection molding machine (A = size 210 with a 30 mm screw, B and C = size 60 with 14 mm screws) were positioned as close to each other as possible to be accommodated on the 752-mm, 3-station rotary table, together with the hot runners laid out for minimal melt volumes.

A SCARA robot connects the injection molding machine with the inspection station.

Micro and standard shot weights

A comparison of the weights of the three polycarbonate components clearly shows that the production of this 3-component part requires a combination of micro with standard injection molding. Every molded part contains 0.1 g of crystal-clear PC, 0.2 g of purple PC and 4.2 g of black PC for the housing.

With the required 4-cavity production, the total shot weights of 0.4, 0.8 and 16.8 grams still remain at the lower limit of standard injection molding technology, especially at the first two injection stations.Major secondary goals included production without sprue where possible and, consequently, the lack of necessity for recycling. Accordingly, the choice of the ideal injection molding technology was a real challenge for the PROMOTECH project team, especially since insertion and insert-molding of

Following inspection, the parts are deposited in transport trays by a transfer packaging station.

three contact pins for every part had to be integrated into the injection molding process as well. Christoph Feichtenschlager, project leader at PROMOTECH, comments: "Our many years of experience in the production of metal/plastic hybrid parts prompted us to choose a vertical machine concept. We also wanted to inject all three material components directly, that is, via a hot runner system in each case. In spite of the shot volumes, some of which were extremely small, we wanted to minimize the dwell times as much as possible in the hot-runner distributors. So, only the most compact injection molding system with the shortest possible melt paths and minimal melt volumes could suit our purpose. This concept provided the basis for our bidding procedure. Following comparison of several systems, we finally found that the concept proposed by the injection molding manufacturer WITTMANN BATTENFELD suited us best."

The rain/light/moisture sensor is a 4-component part: two lenses made of crystal-clear PC, plus seven lenses made of purple PC, and the housing consisting of black PC. Three metal contact pins, which are placed into the mold and then insert-molded, are the fourth component.

Ultra-compact vertical machine

The BATTENFELD solution is a machine model with the complex designation VM 100/210/60/60 R 752. This name stands for a machine with a vertical, fully hydraulic, 4-tie-bar, 100-ton clamping unit and a 3-station rotary table with a diameter of 752 mm and three injection units, which are also vertical, in sizes 60 (twice) and 210. Two injection units with 14 mm screws are the smallest injection-molding aggregates with standard screws. The third aggregate is equipped with a 30 mm screw.

Wolfgang Glawatsch, project coordinator at BATTENFELD, comments: "Although we have used modules from our standard range as much as possible, the design of this system was anything but a standard task. As already mentioned above, minimization of the material paths and material quantities in the hot runner system was the top priority in the configuration, in order to keep the dwell time of the polycarbonate and potential damage to the material below the critical level." So all project partners had to target maximum compactness from the very beginning. Partners besides WITTMANN BATTENFELD were Mold Masters, as manufacturers of the hot runner systems, the mold-maker KTW and the automation equipment manufacturer MKE. Implementing this project required thinking out of the box at several points, for example, by concentrating the five original production steps required to make this multi-component injection-molded part (insertion of the metal pins, injection of three different materials, removal of finished parts) on only three stations. This concentration was the only way to accommodate the 3 × 4-cavity mold system on the 752 mm rotary table.

Small-quantity molding packed extremely tight

Integration of the two micro injections in one of the three rotary table stations makes it possible to use just one hot runner system for guiding both materials simultaneously on two levels via needle shut-off nozzles, each leading to the five injection points per cavity. Accordingly, the machine designers have placed the two smallest aggregates (designated as B and C in the respective picture) as close as possible to each other on the fixed platen of the machine. But in spite of all these machine and mold technology features, an additional process technology trick had to be used to ensure a safe material dwell time in the hot runners. This was achieved by producing a small-volume material disk together with each part, and then transferring it to the reclaim process by the parts removal handling system at the end of each cycle.

During the next step, the standard aggregate (A) insert-molds the housing around the optical parts. At the third rotary table station, a handling device simultaneously removes the finished parts. This is immediately followed by placing the metal contact pins into the cavities, which is accomplished by a high-precision robot arm during cooling, all within the 21-second production cycle.

Vertical system as part of a production cell

The WITTMANN BATTENFELD injection molding system is only part of a complex production cell. In addition to the injection molding machine, this production cell incorporates two more rotary cycle systems, in which the finished injection-molded parts are inspected (plug function, completeness and dimensions of the finished part). Next, the parts are deposited on transport trays. The connection between the injection molding machine and the peripheral equipment for quality inspection and packaging is handled by several SCARA robots.

Simultaneously, the metal contact pins for the connection plug are punched, bent precisely and prepared for transfer by the handling system, all done by equipment contained in the same production cell. All in all, a plethora of technology is required to produce this high-precision sensor component.

"But in spite of all this complexity, our daily production practice furnishes the proof that we were on the right track with our concept, which is largely based on WITTMANN BATTENFELD's experience in nano and micro injection molding", says Günter Benninger, Managing Director at PROMOTECH, in his status report, to which he adds an explicit commendation of the fast, competent after-sales support provided by the BATTENFELD service team for this equipment. ◆

MAYWEG GmbH: success through high quality standards and diversity

With all types of high-quality, technically demanding plastic parts, MAYWEG GmbH, based in Halver, Germany, has successfully defended its prominent market position for 50 years. In WITTMANN BATTENFELD, the company has found a partner which meets its stringent demands in terms of injection molding equipment.

Gabriele Hopf

In September 2013, MAYWEG celebrated its 50th anniversary. Established by Friedhelm Mayweg in Schalksmühle to produce tooling, it diversified into plastics technology in 1970 with the acquisition of its first injection molding machine. In 1993, the year of its relocation to Halver, the company had nine injection molding machines and a workforce of 23 associates. Today, the family-owned company managed by Bernd Jannack employs 125 associates at this facility and achieved 21 million Euros in sales in 2012. Its main market is Europe, primarily Germany.

MAYWEG works with a high degree of automation – here, fully automatic production of a radio control system with an integrated link to another control system is shown.

A diversified product portfolio

At first glance, MAYWEG's most eye-catching attribute is its diversity. Yet its main focus is on technically demanding, complex parts, with weights ranging from less than one gram to 1.6 kg. These include, for example, parts with an attractive surface generated by mold induction, parts produced with internal gas pressure, two-component parts, parts produced by hybrid assembly injection molding and much more. Any conceivable materials are used, including high-performance materials, transparent materials or, most recently, bioplastics and antibacterial plastics. However, it is not only the diversity of MAYWEG's products that is impressive, but also its extensive portfolio of services.

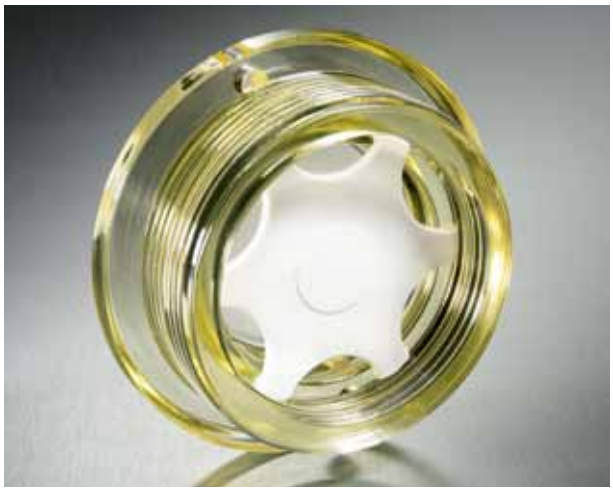
MAYWEG offers everything from a single source. This includes mold design, various analyses, prototyping, sampling, project management right up to series production, and special services such as laser treatment, printing and varnishing. These manufacturing services are also offered by the assembly company ESEN based in Lüdenscheid, which is 75% owned by MAYWEG and its subsidiary in Turkey. MAYWEG's customer base includes well-known companies such as Hörmann (housings for gate control systems), Siemens (piezo switches), Albrecht Jung (electronic systems), Vorwerk (vacuum cleaners), Wilo (heating pumps), Kostal (automotive parts) and TRILUX (lamp shades).

From the left: Bernd Jannack, Managing Partner of MAYWEG GmbH, Erik Vandevelde, Production Manager at MAYWEG, and Frank Höher, WITTMANN BATTENFELD salesman, in front of an EcoPower 300/1330.

Automation and modern equipment

One of MAYWEG's most successful strategies is its investment in machinery, which is a necessity because of its claim to be consistently working with the latest technologies. Investment in modern equipment is also a decisive factor in

WITTMANN BATTENFELD HM 500/3400 with a R20E robot and the AIRMOULD® system.



meeting the challenges of resource conservation and energy efficiency. On a 7,400 m² production floor, MAYWEG currently operates 53 injection molding machines with clamping forces ranging from 15 to 500 t, of which 30 are from WITTMANN BATTENFELD. As for automation, about 40 of the robots on site have come from WITTMANN or WITTMANN BATTENFELD (mostly equipped with servo axes on the operator side).

The cooperation between MAYWEG and WITTMANN BATTENFELD (formerly BATTENFELD) has been in existence for 20 years. During this period, primarily hydraulic machines from the HM series were purchased. At the beginning of 2011, an all-electric *EcoPower* was installed for the first time, followed by a second machine of this type several months later.

"The *EcoPower* enables energy-efficient, resource-conserving production," says Bernd Jannack, who appreciates the machines from WITTMANN BATTENFELD for their compact design, which contributes to their high cost-efficiency and effectiveness since the size of the footprint constitutes a significant cost factor. Last but not least, another strong argument in favor of WITTMANN BATTENFELD is the equipment's great user-friendliness. In view of the declining level of education and training in some aspects of the production process, Bernd Jannack spoke of what he believes to be a trend towards future "self-explaining" machines.

This concept is already being worked towards by WITTMANN BATTENFELD today with its wide range of services, which also includes features such as the service hotline and around-the-clock web service.

As a complete system supplier on its own markets, MAYWEG is glad to have the WITTMANN group by its side as a partner in the area of injection molding who also delivers suitable automation and all peripheral equipment. As Jannack puts it: "We really appreciate the possibility of acquiring a complete system from WITTMANN BATTENFELD. This ensures that we get an optimized solution all around."

Radio remote control unit from Hörmann with high-gloss surface achieved by inductive mold tempering.
(Photo: MAYWEG)

Process competence and top-class advice

A diversified product portfolio such as MAYWEG offers requires diversity and, above all, flexibility from the machine supplier in terms of equipment packages and process technology. For example, MAYWEG uses AIRMOULD® gas injection technology to produce lightweight parts without sink marks or warpage. These are primarily rod-shaped or plane parts (e.g. handles, housing components). Finally, the company also has a multi-component machine from WITTMANN BATTENFELD with 180 t clamping force. For the future, MAYWEG plans to extend its clamping force range up to 1,000 tons.

Apart from the quality of the injection molding technology, the quality of cooperation also plays a vital part for Bernd Jannack in selecting his suppliers. This quality is a given in every respect at WITTMANN BATTENFELD, says Jannack, highly praising the customer support provided by the WITTMANN BATTENFELD sales team. "A company's success depends on everyone involved, including its suppliers. We rely on a sound, long-term business partnership." ◆

Component for rail guidance in a garage. Picture below: Oil level indicator component, produced with the WITTMANN BATTENFELD AIRMOULD® process and ultrasonic welding.
(Photos: MAYWEG)

***Gabriele Hopf** is the Marketing Manager of WITTMANN BATTENFELD in Kottingbrunn, Lower Austria.*

WITTMANN DRYMAX optimizes the WPC injection molding process

With the development of the patents for "Fasal" for injection molding applications and "Fasalex" for profile extrusion, the Institute for Natural Materials Technology (University of Natural Resources and Life Sciences, IFA Tulln, Austria) was established 18 years ago. To achieve higher water resistance and process stability for this wood plastic composite, the DRYMAX was used very successfully in the course of a test series.

Hannes Frech – Norbert Mundigler – Eva Sykacek

The DRYMAX D60-150-PDC-180C used at the Institute for Agrobiotechnology (left) and the positioning of the temperature sensors (right).

From left to right: Soiling and water condensation on the molds. – Dark marks on the gaming piece due to soiled ejectors. – A perfect Ubongo gaming piece: high product quality through optimized drying.

The water content of the granulate used has a decisive influence on the processability and quality of injection-molded parts. In thermoplastic processing of hygroscopic plastic materials, even a low water content can lead to the formation of bubbles and striations. To prevent loss of hardness and ensure perfect processability, plastic materials such as PET or PBT are normally pre-dried to a water content below 0.04% prior to thermic processing. Similar problems can also occur in polyolefins if these are filled with a significant proportion of wood flour. Wood is a hygroscopic material which draws water from the ambient air, stores it in the cell walls and binds it there.

WPC injection molding of large-volume gaming pieces

The necessity of adequate pre-drying for WPC injection molding became obvious at the Institute for Agrobiology during sampling of the molds for "Ubongo 3D" gaming pieces. The pieces have edge lengths of at least 14 mm and a maximum volume of 13.72 cm^3. The material used was Fasal BIO F337 combined with four different color masterbatches. Fasal is a wood flour/PP compound with a relatively high wood flour content. Due to the high proportion of wood, the material's water content can rise to more than 1%, if it is stored for any length of time – which makes pre-drying indispensable.

Four different molds were used, with ten cavities each and varying according to the sets of pieces required. First, the granulate was pre-dryed for four hours at temperatures of 120°C, using a circulating air dryer available at the institute. Circulating air dryers operate with ambient air, which may be high in humidity, depending on the climate. Consequently, the drying performance is inferior to that of dry-air dryers, even with higher drying temperatures. Moreover, the quality of the air in circulating air systems depends largely on seasonal conditions.

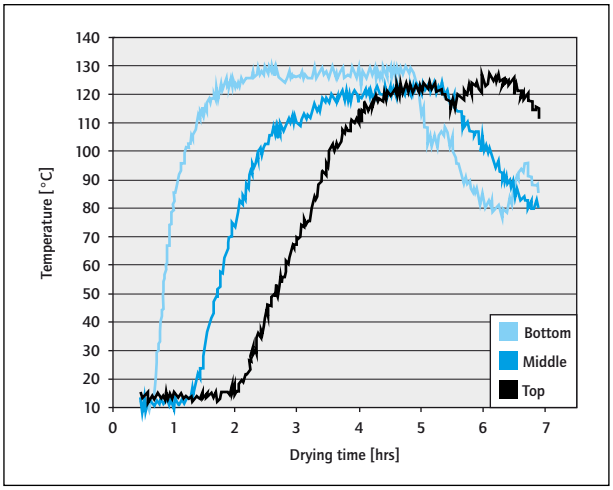
For this particular test series, the barrel temperature of the injection molding machine was first set at about 190°C, with a cycle time of 45 seconds.

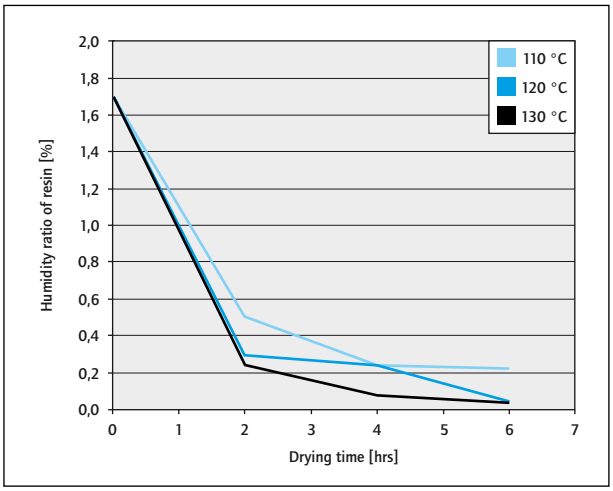
The problems during the first tests were due to the necessity for extended cooling times; the game pieces showed inhomogeneity in dyeing and produced unpleasant combustion odors, irregular cavity filling and dark marks on the molded parts, which were caused by soiling on the ejectors of the mold.

The machines required more frequent servicing due to rust developing on the molds and an increased need for cleaning the parting lines and ejectors.

These defects can be attributed to the water remaining in the cell walls of the wood due to insufficient drying. During the injection molding process, the granulate in the barrel is heated to around 200°C, which causes the water contained in the wood to evaporate.

The vapor cannot escape from the closed barrel and therefore remains in the hot melt. During the injection phase of the material into the mold, the plasticized material is pressed at high speed through a narrow gate, which causes a further rise of the pressure and temperature inside the melt.





Only inside the cavity of the mold is the injected material allowed to expand. Due to the large volume of the pieces and the relatively small part of the mold through which the vapor can escape, the released vapor penetrates under high pressure into any dents or pores present in the mold. The resulting contamination is due to the extraction of wood ingredients caused by heat and water.

Optimization of the drying parameters

Insufficient pre-drying of WPCs impairs process reliability and the quality of parts, and shortens the service life of the mold. The most important, and often neglected, preparatory step for WPC injection molding is optimal pre-drying of the granulate. Here, decisive factors are the type of dryer, the temperature and the duration of drying. In order to optimize the drying of Fasal BIO F337 for the sake of injection molding quality, and also to save time and energy costs, several tests were carried out at the Institute for Agrobiotechnology using the DRYMAX D60-150-PDC-180C dry air dryer from WITTMANN.

The great advantage of this system is the use of dry air of consistent quality. The dryer is also equipped with return air cooling and a condensate trap to remove wood components which impair the quality of the granulate from the drying circuit. A WITTMANN FEEDMAX A206-PDC material conveyor was used to feed granulate into the top part of the drying silo.

Finally, the dried material was transferred to the dosing unit with the help of a FEEDMAX B203-PDC installed on the injection molding machine. Thanks to the special equipment of the DRYMAX with three temperature sensors inside the upper, middle and lower segments of the drying silo, it was possible to monitor the temperature distribution in the granulate precisely for several hours.

The drying temperature setting varied between 110, 120 and 130°C. The effect of the length of the drying period on the resulting residual water content of the granulate was checked after 0, 2, 4 and 6 hours in each case, with the heating phase being included in these periods. The samples of granulate subjected to the various drying processes were taken directly from the dosing unit to the injection molding machine by shifting the feed hopper, and stored in vapor-tight containers.

To measure the water content, the water was first extracted from the granulates with the help of anhydrous methanol. The extraction process took 2 weeks. In an aliquot from this extract, the quantitative water content was measured by the Karl Fischer chemical method.

From each drying test – and also from the undried reference material – 2 samples were taken every time with subsequent repeat determinations being carried out (4 readings per sample). The granulate samples subjected to varying drying processes were also injection-molded with subsequent inspection of the mold surface and the quality of the pieces.

Temperature sequence in various zones of the drying hopper, starting with the heating phase. Once the exhaust air temperature of the drying silo reaches the set value, the temperature is lowered again to protect the material against overdrying, also saving energy.

Water content of the resin depending on the drying temperature and drying period. With the higher temperatures of 120 °C or 130 °C and drying periods of 4 to 6 hours, the granulates reach the optimal moisture level of 0.05% or 0.03%.

Results and conclusion of the IFA test series using the DRYMAX

The tests on Fasal F337 with an initial water content of 1.71% have revealed that fast, efficient drying of WPC granulates requires a drying temperature of at least 120°C. As expected, drying out the granulate proceeds much faster at higher moisture levels than with a water content below 0.3%. All granulates with a water content of more than 0.08% caused condensation, soiling of the molds and dark marks on the gaming pieces.

Excellent processability and an extremely high product quality standard were achieved by using the granulates which had been dried at 130°C for 4 to 6 hours.

The associates of the Institute for Natural Materials Technology who had taken part in the test series expressed great satisfaction with the high quality of injection molding achieved by using the dry air dryer from WITTMANN. ◆

Hannes Frech *is responsible for injection molding at the Institute for Natural Materials Technology of the University of Natural Resources and Life Sciences (Vienna), IFA Tulln, Austria.*
Norbert Mundigler *is the Head of the Institute.*
Eva Sykacek *is a research fellow at the Institute.*

Consistent use of automation ensures quality and productivity

Even when producing simple parts, the use of robots and automation pays off. Automation allows for short cycle times and highest process reliability which makes for low costs, which in turn leads to a quick return on investment, especially in mass production. This is impressively demonstrated by the German Busch-Jaeger company, which specializes in plastic parts for electrical installations.

Walter Klaus

Plastic switches from the Busch-Jaeger portfolio. Top-class design and absolute reliability of the products, and their trouble-free, automatic mass production, have ensured corporate success for decades.
Photos: Busch-Jaeger

Busch-Jaeger, today a member of the ABB group, can look back on more than 130 years of corporate history. The company employs some 1,000 associates, of whom 260 are working at the Bad Berleburg Aue facility, where several million parts are produced annually. The vast majority of the numerous injection molding machines there are equipped with robot systems, which ensure efficient production in every respect.

In the end, different parts are arranged as sets of parts.
Photo: Busch-Jaeger

State-of-the-art production equipment guarantees market success

Even though the products made by Busch-Jaeger have either remained basically unchanged or changed only very slightly for decades – i.e. flip switches, of which several millions are produced every year – working with ultramodern equipment is still an absolute necessity in order to keep pace with the market.

One of the secrets behind Busch-Jaeger's success is that their existing injection molding machines and automation components have been consistently kept on par with the state of the art or have been replaced with machines or components that do. This has led to Busch-Jaeger operating an extremely large number of WITTMANN robot systems today, which have been acquired over the years. The W312, which was used back in 1994, was subsequently followed by various models from the robot series W6 and W7, and most recently by the new W821 model with an IPC control system, which can be equipped with all current software modules.

This process of constantly renewing and updating the machinery admittedly increases the investment costs, but it also consistently reduces the cycle times and continues to contribute to improving quality standards – in short: the proportion of good parts per time unit keeps rising. The experience of past decades has shown that a consistent, attractive return on investment can be achieved in this way, since the quality and time advantages outweigh the higher investment costs. Two examples of the further development of technical standards in injection molding automation will

be described here, but they are representative of many others: *SmartRemoval* and *SoftTorque*. Both are newly developed software modules which are compatible with the R8 control system generation and facilitate easier and, in many cases, significantly faster parts removal.

The *SmartRemoval* function calculates the fastest and most effective removal process from the entry of just a few coordinates, which facilitates the work of the programmer and/or machine operator substantially.

The *SoftTorque* function allows the finished part to be pressed into the robot gripper with the help of the ejectors. In this process, the demolding axis of the robot can be actively pushed backwards, thus compensating the forces pushing in the opposite direction. In this way, the mechanical components are preserved effectively over a long period of time.

Robot design to corporate standards

Over the years, Busch-Jaeger has made agreements with its suppliers concerning certain modifications and the design of interfaces for the grippers and automation components developed in-house, which make both standard processes and quick mold change extremely simple and trouble-free.

Various further processing steps which follow parts removal are normally handled by peripheral appliances, which are either produced by Busch-Jaeger's own service team or by automation specialists to Busch-Jaeger's specifications. These processes are combined in production cells and then controlled and monitored by the WITTMANN robot control system. The engineering department of WITTMANN Robot Systeme in Nuremberg is recognized and appreciated at Busch-Jaeger as extremely cooperative, which explains why this partner has been chosen again and again.

Pushing in luminous caps, laser printing, assembly of metal brackets, packaging – all of this happens within only a few seconds. Prior to packaging in shipping cartons, the sets of parts are subjected to a brief quality check by well-trained staff who can identify defects or missing parts within tenths of seconds.

For operating its equipment, Busch-Jaeger relies on the competence of its own staff – and in the case of robots they rely on the fast, very well-trained and absolutely reliable 24-hour service team of WITTMANN Robot Systeme GmbH, based in Nuremberg. ◆

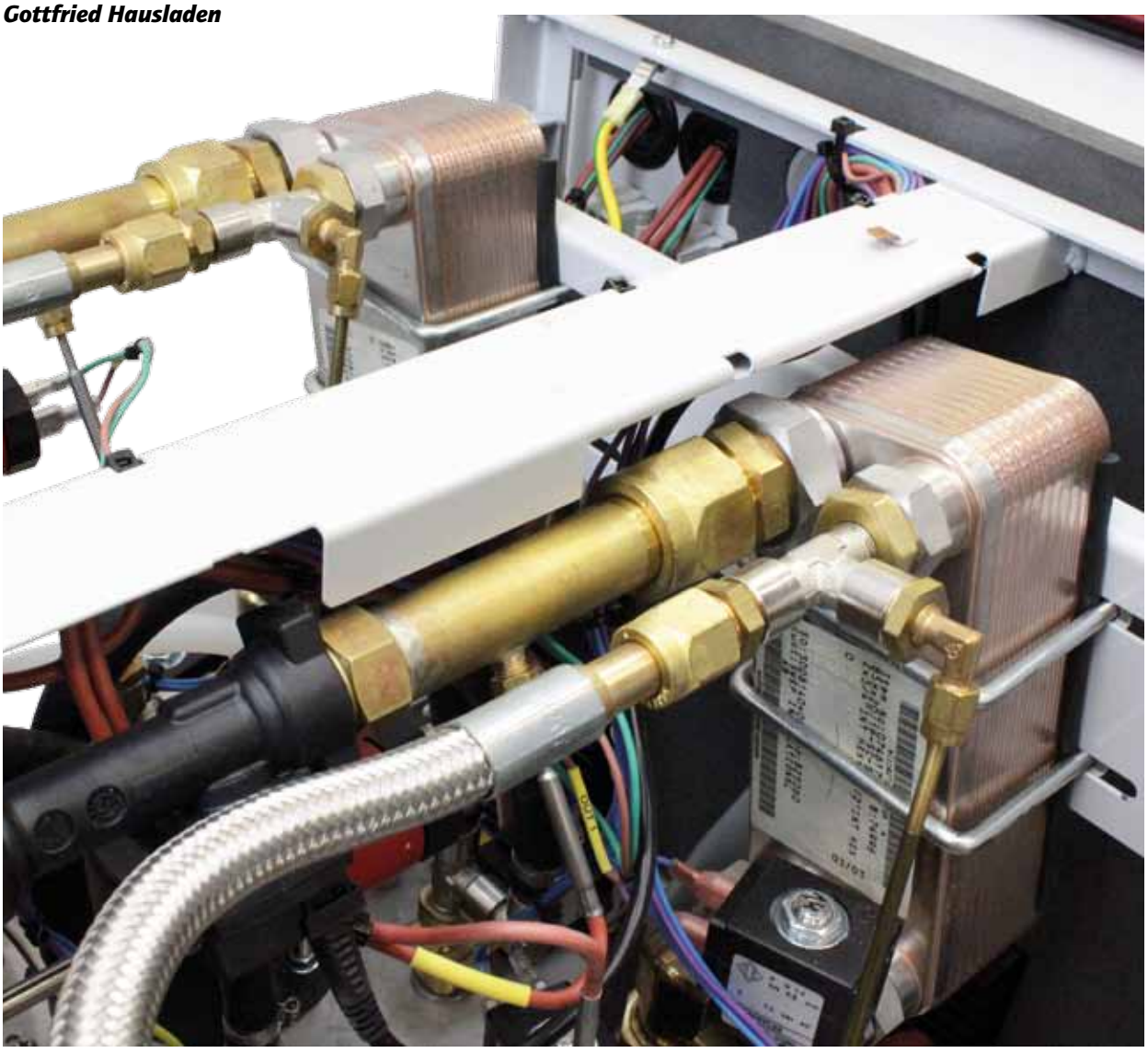
A traditional company is consequently automating its production: for the most part, the Busch-Jaeger production in Bad Berleburg Aue is equipped with high-quality WITTMANN robots.

Walter Klaus *works as a consultant and technical writer. Until 2008, he was the Chief Technical Officer of WITTMANN Robot Systeme GmbH in Schwaig, Germany.*

TEMPRO temperature controllers use waste heat

FKT GmbH based in Pförring, Germany, draws its energy supply from a combined heat and power plant, which also serves as the source of heat for the TEMPRO temperature controllers used in the FKT injection molding shop – an intelligent method of reclaiming waste heat by intelligent equipment from WITTMANN.

Gottfried Hausladen



A view of the special technical equipment of the temperature controllers in operation at FKT shows the additional heat exchanger plates installed in the TEMPRO plus D appliance.

FKT is a specialized system supplier of wind deflector systems and luggage compartment and storage space management components to well-known OEMs and automotive suppliers. The company was established in 1997, employs some 160 associates today and realizes 20 million Euros in sales. Initially, their plastic parts were purchased from sub-suppliers, but in 2011 FKT decided to build its own injection molding shop so that it was able to manufacture these parts in-house. Since most of the assemblies manufactured by this company consist of several different plastic parts, in-house manufacturing has made it possible to achieve more flexibility and better quality, all with less inventory. As a first step, five all-electric machines were acquired with clamping forces from 50 to 350 t.

Temperature controllers use waste heat

In 2011, a combined heat and power plant with 3,400 kW heat output was constructed. The renewable energy generator, fueled by wood chips, is used to ensure an independent

power supply and to heat the company's production and office buildings. The output is sufficient to supply seven neighboring business customers with heat as well.

The search for suitable heating consumer appliances was already begun during the planning stage in order to find effective uses for the energy being released in the form of heat. So Guido Günthner, FKT's Chief Technical Officer, presented WITTMANN with a special request: the TEMPRO plus D temperature controllers should also be able to use the waste heat from the combined heat and power plant to perform their tasks. The hot water, heated by the operation of the combined heat and power plant to about 70°C, was to be delivered to the individual temperature controllers via an insulated hot water pipe system. The need for mold heating temperatures that were above those of the hot water supplied had to be taken into account too. Additionally, in order to influence heating times during mold change, an option of using both the hot water supply and the heating rod should be available.

This requirement was met by having an additional heat exchanger plate installed inside the tank of the temperature controller. The hot water circuit integrated in the appliance is controlled by a separate pump. When required, the water in the circuit flows around the heat exchanger plate, which then releases its heat effectively. The heating rod that is also installed in the tank only supplies the energy input for temperatures required in the mold circuit that cannot be reached by the heat exchanger alone.

The combined heat and power plant at FKT supplies heat not only to its own corporate buildings. Seven more neighboring businesses can be supplied with it as well.

Presentation of typical plastic parts made by FKT in the entrance hall of the corporate premises in Pförring.

Highly sophisticated functions

Regulation of the system is effected via the user-friendly touch screen display of the TEMPRO plus D appliances. In addition to the standard parameter settings available, the *EcoMode* can be activated here and adjusted according to the actual need as well. This allows the user to set the temperature difference between the actual temperature inside the tank and that of the hot water supply, where the heating rod can be activated for additional heating. For example, if the temperature difference is set at 5°C for a hot water flow temperature of 70°C and a desired mold water temperature of 80°C, heating during the mold heating phase first proceeds up to a mold water temperature of 65°C. Once 65°C has been reached, the pump switches itself off and the heating rod takes over, raising the temperature inside the mold circuit to the desired 80°C.

Results achieved

After two years of continuous operation, a reduction of about 80% in energy input for the heating phases can now be confirmed for one of the temperature controllers that is used at FKT in the way described above. This result is due to the relatively short phase during which the temperature controller is required to supply energy to the system. Normally, external energy input is only required during the mold heating phase, and most of it is supplied via the heat exchanger.

The heating rod only goes into action when mold water temperatures above 65°C are required. (Generally speaking, injection molding processes mainly require cooling to dissipate the energy input from the injected melt.) In particular, responsible use of energy can contribute substantially towards a positive bottom line. Josef Karrer, Chief Financial Officer of FKT GmbH, emphasizes the necessity of a well-functioning overall concept as the only way to achieve the goals set in this area.

Finally, the "combined heat and power plant project" has given birth to a new business segment for FKT GmbH: specialized consultancy services and implementation of modern energy concepts in companies operating under similar conditions. ◆

Gottfried Hausladen *is Sales Manager for the Southern Region of the Bulk Materials Department at WITTMANN Robot Systeme GmbH, Germany.*

Series
My EcoPower

Chin Tai Plastic and the *EcoPower* machine

Austria and Taiwan: Chin Tai Plastic, a successful Taiwanese molder of medicine bottles and caps of high renown, benefits from the EcoPower injection molding machine from WITTMANN BATTENFELD.

Huang Chen-Huang, General Manager of Chin Tai Plastic, Taiwan, and Huang Chun-Hung, Assistant General Manager (from left to right).

My EcoPower:
Part 6

Respondent:
Huang Chen-Huang

Position:
General Manager

Company:
Chin Tai Plastic

Location:
Taiwan

- *What size and spec are your EcoPower machines from WITTMANN BATTENFELD?*
  We now have 4 *EcoPower* machines, three with 110 tons of clamping force, and one with 180 tons. Besides those, we also have one HM 180 injection molding machine from WITTMANN BATTENFELD.

- *How long have you been running them?*
  We have been using one of them (110) for about three years now, the other three have been in use for one year.

- *What products does your business make?*
  We make pecial medical packaging, such as packaging for eye drops, and so on.

- *What products are your EcoPower injection molding machines typically making?*
  Typically, they are making medicine bottles and caps.

- *How many molds/tools are you typically using on your EcoPower machines?*
  I would say, normally there are about 20 sets of different molds used on our *EcoPower* molding machines.

- *What are your favorite design features on the machines?*
  The WITTMANN BATTENFELD machines are neat, the save energy, and they are providing an extremely high production accuracy.

- *What operational advantages have you noticed on the EcoPower?*
  EcoPower machines are user-friendly, easy to maintain, and they have many useful features.

- *What changes in energy consumption have you noticed on the EcoPower?*
  EcoPower injection molding machines save much more energy compared to other (hydraulic) machines.

- *What other energy savings or efficiencies have you noticed about the workings of the EcoPower machine?*
  We have achieved a very high production stability, and the reaction of the machine is very quick.

- *What sort of payback period are you expecting? Maybe you have renewed your payback calculations since buying the WITTMANN BATTENFELD machines?*
  For us, the most important targets were to get to a stable production and a very clean production process.

- *Does your EcoPower have a nickname?*
  Indeed, we have chosen a nickname: "Small flower".

- *Have any of your customers seen your new EcoPower?*
  Yes, of course, many of them. All our main customers came to visit us.

- *Where next for your business?*
  We started a new step forward in the year 2013, and we have expanded our production facility. We want to meet all of our customer's expectations, and we want to increase our overall production efficiency (reduce production costs and staff requirements).

- *Where next for you and the EcoPower?*
  We will further increase the output of the production using much more automation equipment, and we also want to further improve the machine's capacity utilization. ◆

Articles that appeared in *WITTMANN innovations* so far

In-Mold Labeling

- WITTMANN IML stack mold systems *3/2007*
- The WITTMANN 2 + 2 stack mold *1/2008*
- ATM d.o.o. in Serbia grows with WITTMANN systems *3/2009*
- Quadrangular IML design at PLASTIPAK in Canada *4/2010*
- Tea Plast in Albania wants to become the Number One in IML *3/2012*
- EcoPower: fourfold IML *1/2013*
- IML as a multifaceted process *4/2013*

Temperature Control

- The advantages of pulsed cooling *1/2007*
- Comparing water to oil *2/2007*
- The new temperature controllers of the TEMPRO plus C series *3/2007*
- The new COOLMAX compact cooling units *2/2008*
- Temperature controller "guarding" injection molding machines *3/2008*
- Temperature controllers with DUO cooling *4/2008*
- Variothermal tempering *1/2009*
- The new TEMPRO plus C180 *2/2009*
- The new TEMPRO direct C120 [C250] *3/2009*
- WFC: WITTMANN Water Flow Control functionality *4/2009*
- TEMPRO plus C180 water temperature controller *1/2010*
- WITTMANN TEMPRO: The universal benchmark *2/2010*
- BFMOLD™ mold cooling system *3/2010*
- The new TEMPRO plus D temperature controllers *4/2010*
- Online-thermography *1/2011*
- Tempering and injection molding at Fuchs & Sohn *2/2011*
- TEMPRO plus D in the automotive sector *1/2012*
- Oscilloscope function *2/2012*
- Compact temperature controller *4/2012*
- Quality assurance through the optimal tempering process *1/2013*
- The Starlinger special solution *2/2013*
- New WITTMANN tempering and flow control equipment *4/2013*

News From The Subsidiaries

- Australia *2/2008, 2/2013*
- Austria *2+3/2008, 1/2010, 3/2011, 4/2012, 3/2013*
- Benelux *3/2008, 2/2009*
- Brazil *3/2007, 1/2009*
- Bulgaria *2/2009*
- Canada *1/2007, 1+2/2008, 3/2009*
- China *2/2010*
- Colombia *2/2012*
- Czech Republic/Slovakia *4/2009*
- Denmark *1/2009, 1/2013*
- Finland *4/2008+1/2012*
- France *2/2007, 3/2008*
- Germany *1/2007, 3/2012, 4/2013*
- Great Britain *2/2009, 2/2010*
- Guatemala *1/2013*
- Hungary *1/2008*
- India *2/2008, 3/2010, 2/2012*
- Israel *1/2012*
- Italy *4/2008, 1/2010, 4/2011*
- Mexico *3/2007, 3/2009, 1+2/2011*
- Poland *2/2013, 3/2013*
- Russia *4/2012*
- Slovenia/Croatia *1/2010*
- Southeast Asia *2/2007*
- South Kores *3/2010*
- Spain *3/2007*
- Sweden *2/2009*
- Switzerland *1/2008, 2/2012*
- Taiwan *4/2009*
- Turkey *3/2008, 2+4/2011*
- USA *2/2008, 3/2009, 1/2011, 4/2013*

Conveying / Drying

- Central drying and conveying at Robert BOSCH *1/2007*
- Quality control of the WITTMANN dryers *1/2007*
- Drying and conveying system at Kromberg & Schubert *2/2007*
- Cost efficient material drying *2/2007*
- FEEDMAX conveying units fit for the clean room *3/2007*
- The new DRYMAX ED80 material dryer *3/2007*
- Focus on material feeding *1/2008*
- The WITTMANN network control at Arge2000 *2/2008*
- Changing parameters when conveying different materials *2/2008*
- Optimizing a material conveying system *3/2008*
- DRYMAX dryers complete with energy rating *3/2008*
- Metchem central material handling system *4/2008*
- Auxiliaries at Delphi in China *1/2009*
- The LISI COSMETICS central system *2/2009*
- Perfect planning of central systems avoids downtime *3/2009*
- Testing the WITTMANN energy claims at FKT *4/2009*
- The new FEEDMAX B 100 *1/2010*
- Greiner is saving energy by using WITTMANN dryers *2/2010*
- The A.C.S. conveying system *3/2010*
- Tne new FEEDMAX Primus material conveyor *4/2010*
- The new DRYMAX Aton *2/2011*
- The BKF conveying system *2/2011*
- WD Kunststofftechnik and its central system *4/2011*
- PET processor uses a WITTMANN conveying system *1/2012*
- The PLASTICOM system *2/2012*
- The NICOMATIC system *3/2012*
- Saving energy in material drying *4/2012*
- The Bespak material handling *2/2013*
- Vision Technical Molding: Prescription for efficiency *3/2013*

Automation

- Production and quality control in medical engineering *1/2007*
- The handling of large structural foam parts *2/2007*
- The new R8 robot control *3/2007*
- High-end: The production of seat adjustment rods *1/2008*
- Drive engineering for robots *1/2008*
- Automating the production of transponder pins *2/2008*
- Automated production of remote control keys *3/2008*
- Automation at Carclo, UK *4/2008*
- The flexible automation cell as ABA-PGT *1/2009*
- The cultivation of growth with WITTMANN robots *2/2009*
- Bruder toy wheel production *4/2009*
- Production of pallets at Georg Utz in Poland *1/2010*
- EcoMode helps getting energy efficient robots *2/2010*
- Automated production of oil level sensors *2/2010*
- Automating rotation welding *3/2010*
- The new R8.2 robot control *4/2010*
- Linear robots in the clean room *1/2011*
- Super-fast part removal *2/2011*
- Automation of cups and lids *3/2011*
- Superior multi-component molding *4/2011*
- Automating insert molding *1/2012*
- The expert automation of lids *2/2012*
- LSR parts at Silcotech, Switzerland: Quality through automation *3/2012*
- Zero-reject production *4/2012*
- JENOPTIK: Handling of smallest parts *2/2013*
- Schramberg: Most consistent automation *3/2013*

Injection Molding

- WITTMANN BATTENFELD: One stop shopping for injection molding *4/2008*
- Metal injection molding at Indo-US MIM *4/2008*
- Cost optimization: EcoPower by BATTENFELD *1/2009*
- IT assisted services *1/2009*
- Water injection for all-plastic parts *2/2009*
- Krona Indústria and WITTMANN BATTENFELD *2/2009*
- Molding micro-parts with the Microsystem 50 *3/2009*
- Multi-component process at wolfcraft *4/2009*
- Process data acquisition: partnership with Wille System *4/2009*
- The new all-electric EcoPower injection molding machine *4/2009*
- Thomas Dudley and WITTMANN BATTENFELD *1/2010*
- IML with TM Xpress *1/2010*
- AIRMOULD® and AQUAMOULD® Mobile *1/2010*
- Design Molded Plastics and their molding machines *2/2010*
- Stadelmann relies on Wille and WITTMANN BATTENFELD *2/2010*
- The new MicroPower *3/2010*
- AQUAMOULD® and projectile injection technology *3/2010*
- New benchmark in large machines: MacroPower *4/2010*
- STELLA relies on WITTMANN BATTENFELD machines *4/2010*
- The ServoDrive technology *1/2011*
- The 75th machine for Krona *1/2011*
- Packaging specialist TM Xpress *2/2011*
- WAVIN (Czech Rep.) and WITTMANN BATTENFELD *3/2011*
- SANIT molding a success *3/2011*
- WEPPLER Filter using BATTENFELD machines *4/2011*
- MacroPower for the production of cable ties *1/2012*
- The CELLMOULD® process *2/2012*
- ESMIN uses 43 WITTMANN BATTENFELD machines *3/2012*
- Remote connectivity *3/2012*
- Foamed high-quality parts *4/2012*
- LECHNER and the MacroPower *4/2012*
- MacroPower at GT LINE *1/2013*
- Praise for the standard machine! *1/2013*
- Vertical rotary table machines at Electricfil *2/2013*
- BECK's molding technology *2/2013*
- ESCHA using HM machines *3/2013*
- Hoffer Plastics uses HM machines for "focused factories" *3/2013*
- Guppy using the EcoPower *3/2013*
- The Backhaus success *4/2013*
- Incapsulation: clean and safe *4/2013*

Blending

- The new WITTMANN blenders of the GRAVIMAX series *2/2007*
- The truth about blender economics *3/2007*
- The new GRAVIMAX 14V blender *3/2009*
- The art of blending regrind *3/2011*
- Dosing on the highest level *1/2013*
- Precision for safe rail traffic *4/2013*

Granulation

- Inline recycling of sprues *1/2007*
- Giant granulator MCP 100 *2/2007*
- The new MAS granulator *3/2007*
- Challenging recycling process *1/2008*
- The MC 70-80 at Centrex *2/2008*
- Gibo Plast enforces recycling *2/2009*
- MC granulators with AF auger *4/2009*
- Grinding of ferrite *1/2010*
- Grinding critical material *3/2010*
- The TMP CONVERT solution *1/2011*
- Inline recycling with Minor 2 *3/2011*
- Granulators under the press *2/2012*
- Large solutions for large parts *1/2013*

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