innovations
Technics – Markets – Trends
Volume 4 – 2/2010

Vote for Energy Efficiency

IMM 17
IMM 18
Battenfeld only!
IMM 20
Articles that appeared in WITTMANN innovations so far

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
- Conveying: 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 2/2008
- 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

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

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

Temperature Control
- The advantages of pulsed cooling 1/2007
- Comparing water to oil 2/2007
- 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
- TEMPRO plus C180 water temperature controller 1/2010

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 Industria and WITTMANN BATTENFELD 2/2009
- Molding micro-parts with the Micro system 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

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 transfermoulding pins 2/2008
- Automated production of remote control keys 3/2008
- Automation at Carclo Technical Plastics, 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

Granulation
- Inline recycling of sprues 1/2007
- Giant granulator MCP 100 2/2007
- The challenging recycling process 1/2008
- The MC 70-80 granulator at Centrex 2/2008
- Gibo Plast enforces recycling 2/2009
- The new AF auger feeder for MC central granulators 4/2009
- Grinding of ferrite 1/2010

News From The Subsidiaries
- Australia 2/2008
- Bulgaria 2/2009
- Czech Republic/Slovakia 4/2009
- Denmark 1/2009
- Finland 4/2008
- Germany 1/2007
- Great Britain 2/2009
- Hungary 1/2008
- India 2/2008
- Italy 4/2008, 1/2010
- Slovenia/Croatia 1/2010
- Southeast Asia 2/2007
- Spain 3/2007
- Sweden 2/2009
- Switzerland 1/2008
- Taiwan 4/2009
- Turkey 3/2008

WITTMANN innovations (Volume 4 – 2/2010)
Quarterly magazine of WITTMANN Kunststoffgeräte GmbH and WITTMANN BATTENFELD GmbH. Appears to meet the informational demands of staff and customers. Editorial office: WITTMANN Kunststoffgeräte GmbH, Lichtblaustraβe 10, 1220 Vienna; tel. +43-1 250 39-204, fax +43-1 250 39-439; bernhard.grabner@wittmann-group.com; http://www.wittmann-group.com
Issue 3/2010 of "WITTMANN innovations" will appear at the beginning of the third quarter 2010.
Dear Reader,

Green progress. – The buzz word of the plastics industry has been around for a couple of years and still is the effort to develop energy-efficient machinery. Some feedback in the form of press announcements might convey the impression that molding machines are close to turn into perpetual mobiles. However, the efforts behind such research and developments are quite serious and produce remarkable successes. Like so often only a more intense occupation with the topic of energy efficiency reveals the complexity behind this theme.

What high-praised climate conferences are not able to achieve, makes the essential search for efficiency of molding shops possible. Some innovative and forward-thinking companies undergo remarkable efforts and meticulous fine-tuning to determine their energy consumption and therefore, also their competitiveness. Of course, the decrease of the energy consumption is the ultimate goal. A good example of such a company can be found in our article on page 12.

The simplified formula “energy saving = more profit” actually applies and is increasingly used. In this connection, it is important to regard the injection molding process as whole. What brings the most economical injection molding machine, if the peripheral equipment continues to serve as the heating system for the building and this, regardless of the season? After all, the biggest and therefore obviously prime target for energy preservation might not be the biggest energy user at all.

Some kW of heating power within temperature controllers and dryers, as well as some kW with chillers and compressors to supply pressurized air quickly add up. The fact that also a robot can contribute its, admittedly rather humble, share of efficiency increase, shows our article about EcoMode and further advanced characteristics of the WITTMANN R8 robot control on page 7. Here we want to start our assessments and highlight the total consumption of a system. The possibility to learn more about this, will be given in the course of our Competence Days, on April 28–29 in our Kottingbrunn plant. Not only will the topic of energy efficiency be given special attention, but also the progress in our various developments, by department. The introduction of our new molding machine products of MicroPower and MacroPower will be covered.

Of course, we want not to only lecture, but to show you the advantages and progress on the basis of over 70 live demonstrations. Learn-intensive and diversified days are therefore ahead of you.

We would be pleased to welcome you during our Competence Days in Kottingbrunn.

Sincerely, Michael Wittmann

---

<table>
<thead>
<tr>
<th>Editorial</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dear Reader,</td>
<td>Tom Betts on the high quality production at Design Molded Plastics, U.S.A. Page 4</td>
</tr>
<tr>
<td>Green progress. – The buzz word of the plastics industry</td>
<td>Herbert Blieberger on the Stadelmann Gmbh and their Wille K4 system. Page 6</td>
</tr>
<tr>
<td>has been around for a couple of years and still is the effort to</td>
<td>Tomas Kalender showing the possibilities of the WITTMANN EcoMode functionality. Page 7</td>
</tr>
<tr>
<td>develop energy-efficient machinery. Some feedback in the</td>
<td>Gerald Schodl gives an overview of the various models of the TEMPRO range. Page 8</td>
</tr>
<tr>
<td>form of press announcements might convey the impression</td>
<td>Walter Klaus on an entirely successful automation solution in the automotive field. Page 10</td>
</tr>
<tr>
<td>that molding machines are close to turn into perpetual mobiles.</td>
<td>Markus Wolfram gives the result of a drying equipment test series: DRYMAX rules! Page 12</td>
</tr>
<tr>
<td>However, the efforts behind such research and developments</td>
<td></td>
</tr>
</tbody>
</table>
DMP: When your niche is quality even 3 ppm is too many!

Design Molded Plastics (DMP) is a world class custom molder shipping in excess of 50 million parts per year with a 6 Sigma level. They describe their niche as “quality” and even though they have achieved 3 ppm their goal is 0 ppm! Their diverse customer base covers many markets including small appliance, medical equipment, sports equipment, automotive components and agricultural packaging.

Tom Betts

The relationship with BATTENFELD is a long one dating back to 1985 and remains strong with a total of 25 of their 28 injection molding machines being the BATTENFELD brand, of which a large percentage of them fully integrated with all servo BATTENFELD robots. While their requirements are well defined and specific, with high expectations for performance and reliability, they have also had a positive impact on WITTMANN BATTENFELD as a supplier. Both the WITTMANN BATTENFELD design and manufacturing staff have learned from their input and suggestions. The demand for accuracy and repeatability, have pushed the development of the WITTMANN BATTENFELD controls.

DMP’s commitment to same day shipment of product – a pillar of their customer care philosophy, also raises the bar on machine performance and reliability. And, it is WITTMANN BATTENFELD’s commitment to sound engineering and design principles that has enabled DMP to achieve a machine uptime of 98%.

A custom specification and option package, known as “DMP”, was developed consisting of such items as a Moog Servo Valve for injection control, nickel plated platens and feed throat area, core pulls with special monitoring sequences, wear and corrosion resistant screws and barrels to further allow their staff to operate and maintain the equipment efficiently and effectively in order to achieve the “Best in Class” uptime.

Plant and machinery

DMP’s attention to detail from the selection of the specific requirements for each machine, including features, control, color scheme and form and fit, instills a level of pride and an unequalled work ethic for all. From the moment one enters the manufacturing floor you sense this is not your typical molding shop or custom molder.

What is evident is an extremely well engineered plant layout with good raw material and finished part product flow. All machines are supplied with power and water from underground utilities so there are no unsightly power drops or cooling lines nor any chance of interference with the overhead cranes. Also, they do not use a central material handling system because they process more than 350 different resins. What is unique about this molding plant is that all the machines are hydraulic, not electric, yet there is no evidence of oil anywhere. There are no overflowing drip pans or pigs creating a barrier, there simply is no oil to contend with. This can be attributed to two key factors: the excellent maintenance staff at DMP and the design of WITTMANN BATTENFELD injection molding machines. Oil leaks are simply not accepted and any problems are immediately identified and resolved.

When walking through the plant you will notice an assortment of machine sizes and age and while all machines look almost as good as the day they came in the door, the only way one can get even a little hint of the machine vintage is either from the type of display on the control or how much paint has been worn away from the edges as a result of the frequent cleaning and polishing.
The use of the BATTENFELD UNILOG controls with standard process monitoring, quality table and SPC has allowed DMP to achieve nearly unheard of levels of shot-to-shot repeatability and accuracy. This level of control has in part, attributed to their achieving 6 Sigma. With the quality table, each machine monitors at least six and as many as twelve process variables such as fill time, peak injection pressure, changeover pressure and minimum melt cushion to name a few. Each machine has approximately 50 variables to select from and that can be monitored with every cycle.

For example, the quality table allows one to have a quick glance at the performance of the last eight cycles and access of up to 10,000 stored in the B6s control memory. And for each variable, it is possible to see the minimum and maximum value, the mean of the last 50 cycles, the overall mean and the standard deviation. When activated, the control also displays the total errors for the ongoing process with pre-warning and process stop when a monitored variable falls out of tolerance. It is even possible with the B6s control to retrieve data retroactively providing the data has not been cleared from memory. Furthermore, the fully integrated WITTMANN BATTENFELD robots on the injection molding machine allows the robot to isolate any suspected scrap parts by depositing them in a separate isolation area. This feature is ideal for machines running unattended but also for any QA operation.

The machine’s cushion monitoring feature enables maintenance personnel to track the performance of the injection unit and more accurately determine wear. This allows them to plan downtime for inspection and any necessary maintenance. The ability to monitor cushion with a very tight tolerance also provides an additional level of process monitoring for machines running unattended. A change in the cushion can often indicate an issue with the mold such as a broken ejector or core pin or even a broken detail in the mold.

**DMP’s projects and perspectives**

The fact that DMP has exceeded 16% growth every year since 2000 even with the downturn post 9/11 is no fluke. The owners, Diane Hanson and Jay Honsaker, have grown the business located in Macedonia, Ohio, U.S.A. and kept their customers from sourcing off-shore with their 6 Sigma level of quality, on-time deliveries and continued improvements in process efficiencies and labor reduction.

In part this can be attributed to the acquisition of six new BATTENFELD molding machines and fully integrated robots along with the addition of numerous 6-axis servo robots performing secondary operations.

A recent project for a major sports equipment manufacturer supplying product to professional, collegiate and high school teams is a perfect example of their efforts to grow the business. The project had two basic requirements: provide the best possible quality at the lowest price.

When they began the project the process required 12 hourly employees and exposed the process to operator error. To achieve the desired results they purchased two new BATTENFELD machines with the shortest footprint in the industry, allowing them to easily integrate the downstream automation in a compact work cell to produce the product in a more robust process with the highest quality levels while reducing WIP (work in process) and about half of the labor.

DMP has without question developed a unique business model, which is fully supported by WITTMANN BATTENFELD, to ensure not only their success but that of their customer base. It is no surprise that they are expanding their molding capacity by adding a new tool room and moving the warehousing to a 43,000 sq. ft. space off-site to meet their customers’ needs.

As Jay Honsaker notes, “I truly believe competition is what drives world class companies to successful futures. American manufacturers can be globally competitive providing we don’t waste labor, as labor does command a higher cost here in the States.”

---

**BATTENFELD UNILOG controls**

The DMP workshop, equipped with injection molding machines from WITTMANN BATTENFELD.

**DMP** is Injection Molding Regional Sales Manager at WITTMANN BATTENFELD Inc. in Torrington, U.S.A.
The basic version of Wille’s modular K4 process data acquisition system already contains all the necessary tools: a central database, master data management, a powerful reporting and analysis tool and an archive function to safeguard all relevant business data. A slim, modular design and attractive pricing permits the K4 to be integrated seamlessly and cost-effectively into all enterprise processes.

The K4 system at company Stadelmann receives orders from, and also sends back all relevant data to, a SAP environment. Process data acquired continuously during production form the basis for all analysis reports.

“The process data acquisition system provides important information, to optimize our processes. This information is used for the control of processes and to control the results. The material flow, machine utilization, reject rates and many more aspects are constantly available for process improvements as well as pre-and post-calculations”, says Andreas Winkler, technical director at Ernst Stadelmann GmbH in Eferding, Upper Austria.

**The special features of K4**

Alongside the sound, basic configuration of K4, two more factors make decisive contributions: First, K4 offers an unrivalled range of services. Without needing to resort to products from other vendors, the standard configuration already provides the following functions: real-time operation, management of machine setting data of quality assurance and maintenance data, personnel time registration, hall layout and graphic inventory management – right up to fully fledged enterprise resource planning.

“The high degree of functionality and capability of integrating several locations into a single system make us confident that we have chosen Wille as the right partner in developing our company’s future”, continues Andreas Winkler.

The second important aspect is seamless integration of the K4 into WITTMANN BATTENFELD’s machine control system UNILOG B6.

Data structure, menu guidance and tools are perfectly tailored to the needs of the plastics processing industry. As a result, K4 adapts itself perfectly not only to the computing environment, but also to production conditions at Stadelmann.

K4 allows loading of DNC data, starting and stopping of orders, status requests, queries concerning inventory levels, remaining production times, rejects and machine down-times, as well as viewing and input of random sample results. This is possible for all machines, regardless of location and manufacturer.

**A fruitful partnership**

Andreas Winkler from Stadelmann concludes: „Together with our partners WITTMANN BATTENFELD and Wille System, we are, and will remain, equipped to meet the high demands placed on products, as well as the sophisticated standards laid down by the market and our owners. It is essential for any company to work with innovative and trend-setting partners. “
The new EcoMode helps getting energy efficient robots

In recent years, WITTMANN has succeeded in consistently reducing the energy consumption of its products on a broad scale. In several cases, WITTMANN’s engineers achieved truly spectacular improvements in energy efficiency. Even the energy consumption of the current W8 robot series was reduced significantly. The magic word here is EcoMode.

Tomas Kalender

When considering a robot’s energy consumption, many parallels can be drawn with the conditions associated with automobiles. A road vehicle’s fuel consumption is known to depend on the employed engine’s technology and performance, the vehicle’s weight and, not least of all, the driving style.

A robot is not much different. Here too, a basic combination of ideal drive technology, consistent weight reduction (by means of lightweight construction) and energy-optimized movement control is indispensable for a convincing outcome.

Motors

At WITTMANN, the robust asynchronous servo drives of the 1980s and 1990s have now given way almost entirely to high-quality synchronous servo motors with rare-earth magnets. The motors now used by WITTMANN unfailingly achieve efficiencies in excess of 90%. This by far exceeds the requirements of even the strictest energy efficiency class IE4 (Super Premium Efficiency) of the IEC 60034-30:2008 standard which defines current efficiency classes for electric motors.

Recycling of brake energy

A robot’s advantage over an automobile is a consistent use of electric drives. The employed motors act as generators during braking. They return the brake energy to the power output stage which can relay the energy directly to motors for other axes. Alternatively, the returned energy can be stored in intermediate-circuit capacitors and made available for the next acceleration phase.

The EcoMode

WITTMANN introduced an EcoMode with its W8 robot series. If viewed in terms of an automobile’s operation, the EcoMode corresponds to a reserved and anticipatory driving style, as opposed to a racing-car driver’s tactic of speeding and braking. However, it would be a mistake to think that the EcoMode slows down a robot. This mode does not reduce the robot’s maximum achievable dynamics. Furthermore, the EcoMode utilizes the full dynamic range only if it is truly needed. Throughout the remaining period, the robot operates in a measured manner which not only reduces energy consumption, but also conserves mechanical components and increases the robot’s life expectancy.

Conclusion

The energy consumption of WITTMANN’s robots would be admirably low even without the newly introduced EcoMode. The energy consumed by lighter robot models from the W801 onward – including that needed by the control unit, colour display and three servo-axes – is lower than the energy requirement of a standard personal computer. Even a robot in the UHS (ultra high speed) class, such as the W832 UHS, performs very impressively in consumption tests. ♦

Example 1: W823

The energy consumption of a W823, even when operating at the limits of its performance, is about 0.5 kW. This value can be significantly reduced by activating the EcoMode. The larger the reserve of cycle time, the greater the energy savings.

Example 2: W832 UHS

The W832 UHS is one of WITTMANN’s fastest robots. Its energy consumption remains at a level of about 2 kW even at the performance limit. The effect of the EcoMode is impressive: While the robot operates below its performance limit, an active EcoMode soon achieves energy-cost savings of more than 40%!

Tomas Kalender is head of the mechatronics development department at WITTMANN Kunststoffgeräte GmbH in Vienna.
The possibilities opened up through the use of WITTMANN temperature control units are extremely diverse. A multitude of available options is the result of many years of customer-oriented development based on the experience and technical expertise of both WITTMANN and the plastics processor.

The overview below is meant to provide a detailed insight into the flexibility and versatile configurations of WITTMANN’s temperature controllers.

**Two different media**

Covering a wide temperature range from 90°C (195°F) to 250°C (480°F), WITTMANN’s TEMPRO plus series of temperature controllers primarily consists of water-based units, i.e. devices which are operating with water as the heat transfer medium and still used even in the high temperature range extending to 180°C (355°F) (TEMPRO plus C90/140/160/180). Water is a particularly effective medium possessing better heat transfer properties than thermal oil and without the environmental issue associated with oil. Devices which use oil (TEMPRO plus 250) are meant for applications in which the medium needs to attain temperatures of up to 250°C.

**The right selection of a unit**

Three performance features are responsible for ensuring constant part quality and the process reliability necessary for this: heating, cooling and pump capacity.

WITTMANN is an expert in designing temperature control equipment to ideally fit to individual applications. This is done in consultation with users on the basis of their production parameters. Of key importance here is the determination of the required heating power in order to bring the tool to the right production temperature. Selection of the correct cooling capacity enables optimized demolding, while optimal pump capacity ensures that the temperature-control medium circulates at the proper frequency. The parameters listed below form the basis for selecting the best temperature controller model:

- Maximum set point temperature
- Weight/dimensions/material of consumer
- Desired heating time
- Material type
- Quantity of material to be processed per unit of time
- Temperature of material during process

**TEMPRO – A broad portfolio**

WITTMANN’S standard range covers nearly all the different heating, cooling and pump capacities required by the market.

In terms of thermal power (kW at 50 Hz), TEMPRO temperature controllers are available with a capacity of 6, 9, 12, 18, 24 or 36 kW.

The standard cooling capacity is 12 or 152 kW in indirect mode, and 180 kW in direct mode. Indirect as well as direct cooling results in a differential temperature of 70°C between...
Temperature Control

ment system. This is offered as an option for the WITTMANN TEMPRO basic C and TEMPRO plus XL models of temperature controllers

- Karman vortex street: A measuring tube in the flow meter's vortex contains an impediment which triggers opposing vortices. The frequency of the vortex is registered as a pressure surge by a piezoelectric crystal in the sensor, and then used to determine the flow rate. This method is offered as an option for the TEMPRO plus C90 model.

- Ultrasonic flow measurement: Electro-acoustic transducers send and receive ultra-sonic pulses which are evaluated by means of the transit-time differential method and brought into relation with the flow rate. This method is offered as an option for the plus C140 and C160 TEMPRO models.

Enhanced cooling capacity:

Cooling capacity might need to be increased for some complex applications to achieve the required part quality. In the case of the pressurized TEMPRO C140/160/180 temperature control units, the smooth-tube cooling spiral can be replaced with a ribbed-tube spiral which almost doubles the cooling capacity. In the case of TEMPRO plus C units, enhanced cooling can also be activated via software. Using this DUO cooling technique, the unit automatically switches from indirect to direct cooling once a preset changeover temperature is reached. As a result, the cooling capacity increases.

Check valve in cooling water's return flow:

This prevents a reverse flow into the cooling spiral on occurrence of a counter-pressure in the outlet, helping reduce any calcium deposits.

Cooling water bypass:

This method is used for advanced applications which often require very high process temperatures. Such process temperatures might however need to be lowered again rapidly within the specified cycle time.

Cyclical exchange of medium:

A cyclic replacement of water in the temperature control circuit firstly ensures consistently good quality of the circulating medium, and secondly improves tool preservation if conditioned cooling water is used for the operation. At regular intervals, a very small amount of process water is discharged through the cooling-water outlet, and re-conditioned cooling water re-filled simultaneously.

Individual adaptations

In addition to the diverse configurations of the main components described above, there are numerous options available for customizing WITTMANN’s temperature controllers to suit individual needs and requirements.

Serial interface:

An increasing integration of production tools into intranets is making serial interfaces ever more important. Standard specifications include 20 mA, plug-in RS232 and RS485, including a CAN-BUS interface for communication with injection molding machines from WITTMANN BATTENFELD, Arburg, Demag, Engel, Ferromatik/Cincinnati, Krauss Maffei and Netstal. Wherever an interface for WITTMANN temperature control units is not included as standard, it is available as an option (except TEMPRO primus).

Flow rate measurement:

A constant flow is the basis for maximizing part quality. The methods described next are available here, depending on the model type (i.e. maximum temperature):

- Differential pressure measurement:
  A cross-sectional constriction (nozzle) generates a differential pressure proportional to the medium’s flow rate. The differential pressure in the medium is indicated as a flow rate via a measure-

WITTMMANN innovations – 2/2010

Gerald Schodl is Sales Director of the temperature-control technology department at WITTMANN Kunststoffgeräte GmbH in Vienna.
Over short paths: highly automated production of oil level sensors

On passenger cars boasting the latest design, one often searches in vain for an oil dipstick. Familiar to some, this element has now been replaced by an electric oil-level sensor on many models. Built into the oil sump and connected to the on-board computer, this sensor monitors the engine’s oil consumption. Diversified purely in terms of cable length, the sensor is consequently a mass production item suitable for highly automated manufacturing.

Walter Klaus

An increase in production output was the decisive factor: In 2007/2008, Continental Automotive expanded a production facility for filling-level sensors at its plant in Dortmund, with automation as the focus of investment. The layout of the plant as it was in April 2007, the starting point of the expansion and modernization project, is described as follows by Andreas Trauerlicht, project manager at Continental Automotive: „The production process was characterized by long paths, awkward conditions in the workspaces which could only be accessed via three steps, and a disruption of the workflow at intermediate stations“. The contacts to be placed in the injection molding machine, as well as the cables attached to the contacts, lay around in a disorganized manner at the intermediate stations serving as buffers; removal and re-alignment took more time than insertion into the tool’s sliding table.

„Up to that point, our production philosophy had laid heavy emphasis on creating assembly groups at separate, largely independent workstations, and forging them into the final product in subsequent steps defined according to requirement“, adds Dirk Hensel, segment manager at Continental Automotive.

Though this was advantageous in that material shortages still permitted production of the previous stages and at least one of the two injection molding machines remained operable if a piece of equipment malfunctioned, increasing batch sizes quickly brought the disadvantages of this production layout to the fore: The long overall production time, high number of required staff, and high rejection rate caused by frequent manual handling of the cables.

For intermediate storage (buffering), the individual components were loosely placed on top of each other; as a result, on their subsequent removal, some of the sensitive contact plates were bent, thereby delaying the insertion into the injection molding machine.

„This process was by all means appropriate up to a certain production quantity, but no longer acceptable for mass production,” states Trauerlicht.

The gripper has to assume several functions at once.

Replaces the dipstick: An oil-level sensor produced by Continental Automotive. In the first step, the cables are welded to the contact pins/plates (top); this is followed by molding of the connector and the contact. At the bottom the finished product.

Robot dynamics as a factor for shorter cycles

The aim of the project was to reduce cycle times and make the process more efficient overall. For this, it was necessary to group together individual processes and reduce the number of buffer stages. Robots were to ensure a faster transfer of components from one workstation to the next. The project management’s decision ended in a combination comprising, in each case, a vertical injection molding machine and a linear robot of type W711 CSS3, both made by WITTMANN BATTENFELD.

Specifically, high demands are placed on the robots, due to the extremely compact dimensions of the highly ergonomic production cells. The robots have to operate dynamically at high precision in a very confined space. „The short paths in the production cells make it very difficult for robotic mechanisms to attain high operating speeds,” says Trauerlicht. „Steep acceleration and deceleration ramps are needed to achieve the dynamics crucial for the speci-
fied short cycles.” A key building block here is the linear robot’s W-drive technology, with its servo motors and drive modules tailored to the requirements of injection molding technology.

The two injection molding machines needed for the facility were already present at the factory. Thanks to their compact design, they blended perfectly into the concept of short paths besides meeting clamping-force specifications. Only the sliding tables were replaced with rotary tables to allow removal and insertion operations on the second, open tool substructure while the injection process on the closed tool remained in progress. WITTMANN BATTENFELD proved to be a comprehensive partner in matching the intelligent electrical interface between the robot and injection molding machine,” states Trauerlicht. Right at the start of the project, the Continental work group’s project managers detailed not only the optimization goals but also the related time frames. Important milestones were:

- Revised quotation by 18th May 2007; conversion of the injection mold from 4-fold to 2-fold
- Order by 1st June 2007; replacement of sliding tables with rotary tables
- Floor restoration (step 1) by 1st September 2007; planning of the injection molding machine in hall layout under the overhead crane
- Target date (in 16 weeks): 1st December 2007; conducton of a preparatory workshop for mold substitution
- Commissioning in January 2008; preliminary plan for machine implementation and conversion

The new layout eliminated some manual operations and simplified the remaining ones. After the cables are welded to the contact pins and plates in the independent welding machine, the components are manually removed and stored in an organized manner for the next step, until the contacts welded to the cables have been inserted manually into the mounting for the first injection molding process. In cooperation with WITTMANN’s engineering department, Continental tested and optimized the insertion and joining operations using hand-held models. Time studies were conducted by Continental’s preparatory work group to determine the most ergonomically expedient and efficient operating procedures.

**Complex gripper design**

Removal from this unit and insertion into the injection molding machine are performed by the linear robot which is equipped with a complex gripping mechanism at the end of the Y-stroke. The grippers can only dependably grasp and handle the connectors and contact plates at one point measuring a few square millimetres in area in each case. „We knew that exemplary collaboration with the toolmaker right from the design stage onward would be imperative for the success of the project, due to the spatial conditions prevailing in and around the tool”, says Trauerlicht. „A simple gripper equipped with standard elements would not have sufficed, firstly due to the restricted space and secondly due to the complex handling of the parts.”

Continental’s team arbitrated numerous contacts between the toolmaker and Wittmann’s engineering department. A number of assembly groups incorporating high-precision mechanisms were designed from scratch for this application, as were guides and pneumatic elements. The tool concept also needed to be modified. „Here, our work team was able to implement significant modifications, which also had some impact on the final product. This needed to be discussed with the end customer, not an easy task if they happen to be an automobile manufacturer”, says Trauerlicht.

**Monitoring cycle times and workspace conditions**

The gripper assembly responsible for handling contacts/cables and feeding them to the injection molding machine is also used to remove the molded part. This combination is necessitated by the cycle times specified by the manufacturer as well as the available workspace. Consequently, the facility must include grippers for the molded contacts requiring removal, as well as the cables attached to them.

The parts extracted automatically after molding are fed via a conveyor belt to an operator at the second injection molding machine. This person places the cable, including the contacts, manually in the mounting device. Only once both cables have been fixed on the rotary table does the operator release the workspace again to the robot.

„The smooth workflow and entirely successful performance of the automation system have naturally led us to new deliberations,” states Andreas Trauerlicht with a view to the future. „It stands to reason to carry out further improvements after this measure; by that I mean an automation of production processes ranging from reed-contact assembly right up to packaging of oil-level sensors ready for dispatch.”

**Walter Klaus**

was (until his retirement in 2008) Technical Director of WITTMANN Robot Systeme GmbH in Schwaig, Germany.

**SHORT PATHS AND FEWER BUFFERS:**

- The old layout is shown on the left, the new one on the right. There were eight work/ buffer steps per part (see picture):
  1. Welding of the cable assembly group
  2. Buffer
  3. Injection molding of the connector group
  4. Buffer
  5. Injection molding of the sensor group
  6. Buffer
  7. Supermarket
  8. Buffer
- One-piece flow during final assembly in the new arrangement, the welding process and both injection molding processes are grouped into a single unit (1).
... may be less easy, but the use of WITTMANN’s equipment also proves worthwhile from this point of view, for example for Greiner Packaging International. This company with its 2,800 employees is among the leading European packaging producers. Greiner Packaging is a division of the Greiner Group, with 116 locations worldwide and 7,220 employees. The Headquarters of this family-owned company is located in Austria.

Markus Wolfram

ever-rising energy costs are a special challenge which production facilities must today be aware of, regardless of their scale. In the application reported in the following, the first resolve was to assume a pioneering role in energy-cost reduction and thereby set something of an example for others.

All production segments of Greiner Packaging underwent a consistent and detailed analysis in terms of energy efficiency and its related cost reduction. The quest to reduce material drying costs turned out to play a major role here. Materials include PET which must be dried at very high temperatures of up to 170°C (340°F), a process which consumes a significant amount of energy.

A detailed and comprehensive analysis further examined the energy efficiency of drying systems currently in operation and available on the market. The goal was to determine the drying technique best suited to the intended purpose, and the extent to which total energy costs could be reduced.

Only a series of tests would be able to supply the answers to these questions. Accordingly, a decision was made to test dryers from three different manufacturers. For this purpose, WITTMANN supplied a DRYMAX E 180 twin-cartridge style dryer. Material requirements, drying temperature and flow rate were identically defined for all test setups to make the test series comparable.

WITTMANN energy label

WITTMANN’s dryers have received energy ratings for some time now. As the only manufacturer to date, WITTMANN furnishes each of its dryers with an energy label.
directly indicating the dryers energy consumption as determined during a rating process. This is a key advantage for customers, as unsubstantiated claims regarding the electricity / power consumption and energy efficiency are unfortunately too common and easily announced by the various suppliers of dryers.

To improve transparency here, WITTMANN decided to define its own energy ratings through EUROMAP and thus introduce a universally applicable test procedure allowing one to trace down to the finest detail. The goal was to supply the market with systems achieving the highest possible energy efficiency.

WITTMANN's dryer for the energy test

For the test series, WITTMANN submitted a DRYMAX E 180 with a dry-air volume of 180m³/h and a 600-litre drying hopper from the Silmax series.

Comparative tests between WITTMANN's dryer and its competitors also served as a basis for practical evaluations of a new process. Though PET was to be dried at a process temperature of 170°C (340F) in this setup, WITTMANN’s DRYMAX dispensed with the use of a return-air cooler. Conventional dryers employ a return air cooler to reduce the temperature of the air stream returning from the material hopper, thereby improving the dew point and protecting internal components such as filters and fans against excess temperatures. However, a return-air cooler is extremely inefficient in terms of energy, because the cooled return air needs to be re-heated again for the process. The following prospect was therefore considered: If the new WITTMANN procedure of foregoing a return-air cooler proved itself, it would be a revolution in the field of high-temperature applications.

Comparative test

The objective was to determine the most energy-efficient drying process, naturally while ensuring a fulfillment of all criteria concerning the drying of PET. With these provisions, WITTMANN's DRYMAX underwent the series of tests in a system employing two drying cartridges regenerated with the unique method of counter-air flow developed by the company. A SmoothShift function smooths out any possible temperature and dew-point peaks. WITTMANN's SmartReg technology ensures temperature-controlled regeneration and effectively prevents redundant operations during the heating phase of regeneration. These are the proven components which ensure the DRYMAX battery dryers high standards.

A new feature, however, is the absence of a return-air cooler, previously considered indispensable for high-temperature drying and therefore still deployed regularly by other manufacturers. A return-air cooler extracts energy from the dryer, and this energy needs to be supplied again by the process heaters. In other words, heat energy lost during the drying phase is released to the environment and needs to be compensated by means of an additional energy source. This process of pure energy dissipation can be avoided by the use of DRYMAX dryers. A cost-effective deployment of frequency converters now making WITTMANN drying equipment an attractive investment.

DRYMAX with frequency converters

All adjustments needed for testing the “standard dryer” were performed quickly and selectively at WITTMANN’s headquarters in Vienna, where DRYMAX dryers are manufactured. The frequency inverter in operation was configured optimally during the commissioning, actual application settings having been implemented and exhaustively tested at a process temperature of 180°C (360F) without a return-air cooler already before delivery. Finally, WITTMANN’s technicians remained available for providing help and advice for a period of two days during installation of the plant.

The next six months were spent conducting internal benchmark tests on the three different brands. On completion of the tests, WITTMANN DRYMAX emerged as the winner in this drying application. ◆
WITTMANN BATTENFELD UK has been trading on its current Wellingborough site since the beginnings of the company as WITTMANN UK in 1986. Managing Director Barry Hill has led the organization through its changes since that time – and is a well known figure in the UK plastics industry; having served a term as Chairman of the UK’s Plastics Machinery and Manufacturers Distributors Association.

WITTMANN BATTENFELD UK formally opened for business in Wellingborough on Feb 1, 2009 and thus far, the pace of integration of the WITTMANN and BATTENFELD UK businesses has been swift. BATTENFELD completed its move from High Wycombe.

From Wellingborough WITTMANN BATTENFELD UK sales and service engineers are deployed through the UK and Ireland. The UK is reckoned to have a great variety of smaller molding shops – “trade molders” so called – numbering about 2,000 in number – together with a selection of larger 1st tier molding groups such as CTP Group, Bespak, Rosti, McKechnie, RPC and others and also molding shops within OEM companies and branded products.

The trading position of sterling versus world economies has sometimes provided a hedge that has made UK manufacturing export.

The market situation

The recent credit crunch has bitten hard into UK manufacturing generally and spend on injection molding machines has diminished sharply from 2007 through to 2009. Managing Director, Barry Hill believes that in 2010 a corner will be turned, and he is quietly confident about an uplift in the market for the next few months.

“We have a lot of competition here but in terms of business development we couldn’t have wished for a better fit – or a better brand than BATTENFELD – to go with the WITTMANN commitment to best technology. It gives me particular pleasure to report that we didn’t have to make any service engineers redundant. A molder that may be putting off the capital cost of a new molding machine may nonetheless need to invest in other technology – automation, drying, conveying, software etc. WITTMANN BATTENFELD is therefore extremely fortunate to be able to offer a full one-stop-shop for plastics equipment.”

WITTMANN BATTENFELD UK’s efforts

Hill adds that “right now, it’s my pleasure to be organizing a party of leading UK customers to the WITTMANN Group Open House – Simply the Best – at Kottingbrunn, Austria on April 28–29.”

Says Hill, “at a time when so many are cutting back on research and development it is particularly good for us to be showing the UK market all our group innovations at very competitive prices.” Hill says that new WITTMANN investment in the BATTENFELD Meinerzhagen, Germany, facilities have given just the right message to the BATTENFELD UK customer base and that the careful building of loyalty within the UK molding community continues.

WITTMANN BATTENFELD UK has focused its efforts on those areas of injection molding that provided most value-adding, last year winning a series of orders for applications in In-Mold Labeling, and key orders in the packaging and healthcare sectors.

The well-equipped Wellingborough showroom has always been a significant sales asset to the company. Prospective customers can visit and see the new technology in action and the space can also provide extensive scope for trialing production cells for customers before installation at the client premises.

WITTMANN and BATTENFELD machines are also configured in the showroom to allow regular training programs in a number of areas, including robot programming and injection molding process training. The Wellingborough space also allows for extensive stocking of spare parts for UK customers.
WITTMANN entered the Chinese market in 2001, their first sales and technical service company was founded in Shanghai. In 2003, WITTMANN purchased a piece of land nearby Shanghai. The construction of the 7,000 m² plant started in 2004 and was completed within 12 months. The production of robots, mold temperature controllers and granulators started in 2005.

WITTMANN China has founded representation offices and branches in Shenzhen, Tianjin and Taiwan during the last ten years, now it can supply a whole range of innovative injection molding machines and auxiliary equipment to the domestic market, and is offering high-quality sales and after-sales service.

Their Kunshan plant which is located in the beautiful Dianshan Lake Town, is one of the eight worldwide production bases of the WITTMANN Group. The original plant had covered a footprint of approximately 7,000 m², and was extended to about 9,000 m² in 2007. The Kunshan plant with its over 100 employees is housing various departments, e.g. Production, Automation, Finance, HR, Import/Export, Purchasing, Sales and Service, Marketing, etc.

WITTMANN Kunshan is well equipped with advanced machinery such as CNC data milling machines, CNC lathes, grinding machines, laser and plasma cutting equipment, automatic welding machinery, and testing equipment. The products are manufactured according to either European EU standards or UL standards (when supplying the U.S. market). Robots, mold temperature controllers, granulators, conveying equipment, and dryers are produced here – and the Kunshan automation department even is supplying customized solutions.

The Chinese market

The Chinese plastics industry is developing rapidly. The local customers have a growing demand of advanced injection molding technology. This fact is bringing about highly promising market opportunities.

In the Chinese market, the regular customers are active in the following industrial fields: automotive, mobile phones, medical, electronic, and home appliances. By reverting to WITTMANN and WITTMANN BATTENFELD products and service, customers are reducing their production costs. Key account customers are Delphi, Balda, Flextronics, Foxconn, Nypro, BYD, and many locally active enterprises.

Future prospects

In 2010, WITTMANN China will continue to introduce new products to their customers. The serial production of the new dryers and blenders will be executed in China. Also, the Kunshan plant will be extended to satisfy the increasing production needs. The local management is leaving absolutely no doubt about one thing: That WITTMANN China will serve their customers with an even wider product range in 2010 – compared to the foregoing years.