

USER REPORT

Ostrov/Karlovy Vary/Czech Republic + Kottlingbrunn/Austria – March 2018



Photo: author

Fig.1: The focus of the WITTE Automotive production plant, opened at Ostrov in Northern Bohemia in 2016, is on car door handles and the locking mechanisms behind them.

WITTMANN BATTENFELD AIRMOULD® at WITTE Automotive

300 bar pressurized nitrogen under control

The production plant of the German WITTE Automotive group, newly opened in Ostrov / Northern Bohemia in 2016, specializes in the production of car door handles and locking modules in cooperation with the NejdeK plant 20 km away. Its current annual production amounts to approximately 3.5 million units. For this purpose, 14 WITTMANN BATTENFELD injection molding cells are running in Ostrov. About one million of the handles produced are manufactured as hollow parts, using WITTMANN BATTENFELD AIRMOULD® gas injection technology.

The diversity of shapes, colors and functionalities of the external door handles and locking units manufactured at WITTE Automotive in Ostrov, which must also comply with stringent crash safety regulations, is impressive. Yet the product portfolio of the WITTE Automotive group goes far beyond external door handles; it also includes strikers, internal door operating systems, locks and keys, closing aids, door-stays, door brakes and motorized door drive systems.

Focus on surface quality

Since the door and flap handles of a car are seen and felt by its user, their shapes and touch contribute substantially to a car's appearance of quality (Fig. 1). To produce them, a new injection molding plant was built in Ostrov near Karlovy Vary in 2016, with 14 injection molding machines from WITTMANN BATTENFELD with clamping forces ranging from 1800 to 5500 kN as its basic equipment, combined with WITTMANN linear robots and peripherals for automatic down-stream finishing of the injection-molded door handles (Fig.2). An expansion of the facility to 20 production cells is already under way.

The handles are manufactured from PA6-GF30 (with 30 per cent fiberglass reinforcement), the covers from a PC/ABS blend, the structural components behind them from PP-GF 30.

The requirements for consistently high quality of the molded parts with optimal energy efficiency are fully met by the hybrid *MacroPower E 500/2100* machines equipped with an all-electric injection unit and a servo-hydraulic 2-platen clamping unit.

"Depending on customers' specifications, we produce three different types of door handles", explains Pavel Karas, Department Manager Injection Molding at the Ostrov facility during a tour of the production hall. Then he adds: "Handles with incorporated sensors and appropriate electronic devices require an installation space with smooth walls. For this purpose, we produce handles where mechanical sliders inside the mold push out to create the necessary space. The alternative are handles consisting of two or more housing shells held together by snap couplings and screws. The handles without integrated sensor electronics are one-piece hollow parts produced with gas injection technology", and he emphasizes that "this is the most effective method to reduce the plastic wall thickness and consequently the necessary cooling time and material consumption without elaborate mechanisms inside the mold".

This process seems simple, but it requires high-precision process control for optimal results. The first step is to completely fill the cavity and solidify of the outer layers by cooling them on the cavity wall. Then a controlled dose of nitrogen is blown into the plastic melt through injector nozzles under a pressure of up to 300 bar. There, the pressurized gas acts like a piston and displaces the still liquid plastic melt from the core area into an overflow cavity via a mechanically opened channel. Depending on the handle model, the quantity of plastic pushed out is about 25 to 30 per cent of the total volume. The gas pressure inside the now hollow part subsequently counteracts shrinkage through cooling, thus eliminating potential sink marks on the outer surface. At the end of the cooling time, the molded part and content of the overflow cavity are removed, and the contents of the overflow cavity are cut off and recycled for re-use together with virgin material (Fig.3). The cycle time is reduced to about 45 to 50 seconds, depending on the handle model, and is thus roughly equal to that of the process using a slide.

Central pressurized nitrogen network for all machines

When the new plant was constructed, all of the infrastructure components for injection molding production were laid out not only for centralized machine charging and operation, but also for future modular extension. This equally applies to the power connections, the material drying and loading system and the nitrogen supply.

The central nitrogen supply and processing unit is located outside the corporate building. A central liquid nitrogen tank is combined with two gas compressor/vaporizer units. Via a gas bottle aggregate for pressure balancing, they feed nitrogen under a system pressure of 300 bar into the pipeline system of the machine hall (Fig.4).

System integration for easy operation

On the injection molding machines, the pressurized gas is distributed to several individual supply pipelines leading to the injection nozzles inside the mold. Each of these injection pipelines passes through its own pressure regulator, which is controlled by a separate AIRMOULD® control unit. This is an independent device which can be used flexibly on several machines as required. The core of the mobile control unit is a UNILOG B6 control system able to address up to eight pressure control modules and eight core pulls. Its communication with the injection molding machine takes place via the standardized EUROMAP 62 interface specially designed for the integration of fluid injection equipment. On the 15" TFT color touch screen of the AIRMOULD® control unit, pressure profiles can be entered with nominal curves and up to nine freely programmable positions. It is also possible to have actual value pressure curves displayed simultaneously for up to eight pressure control modules. A multi-channel pressure monitoring system and an impulse program for automatic purging of the injection nozzles are also available. The AIRMOULD® control system includes the same basic functions as the machine's control system, such as access authorization via a USB stick or password, and a storage facility for process data, either externally via a USB port or via a network connection (Fig.5).

The gas pressure in the individual nozzle pipelines is controlled by highly dynamic servo valves inside the upstream pressure control units. To keep the controlled section short and to minimize potential losses of gas, the pressure control units inside the machine are positioned as close as possible to the mold, ideally directly on the mold platen. Since, with few exceptions, the handles are manufactured with 4-cavity molds, the gas flow there is divided into four individual streams (Fig. 6). The control modules are designed with the focus on high-precision regulation and monitoring of the gas pressure for both large and small volumes of gas. To ensure consistent gas quality, the control modules are equipped with inlet and outlet filters for the gas stream. The cavities of the mold are connected with their respective control units by individual gas pipes (Fig.7).

Conclusion

WITTMANN BATTENFELD has been supplying equipment for the mass production of thick-walled, one-piece parts with perfectly smooth surfaces free of sink marks for more than 30 years. Thanks to its strategic reliance on in-house development, the company is able to offer integrated system solutions proven in 24/7/365 operation. WITTE's Production Manager Pavel Karas draws his own positive conclusion in this matter: "Due to our position in the just-in-time supply chain of the automobile manufacturers, we are absolutely dependant on permanently reliable production equipment. Here we have always been able to bank on WITTMANN BATTENFELD injection molding technology." (Fig. 8)



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Fig. 2: 14 WITTMANN BATTENFELD injection molding machines at WITTE Ostrov, with clamping forces ranging from 1800 to 5500 kN, producing about 3.5 million door handle assemblies for automobiles per annum.

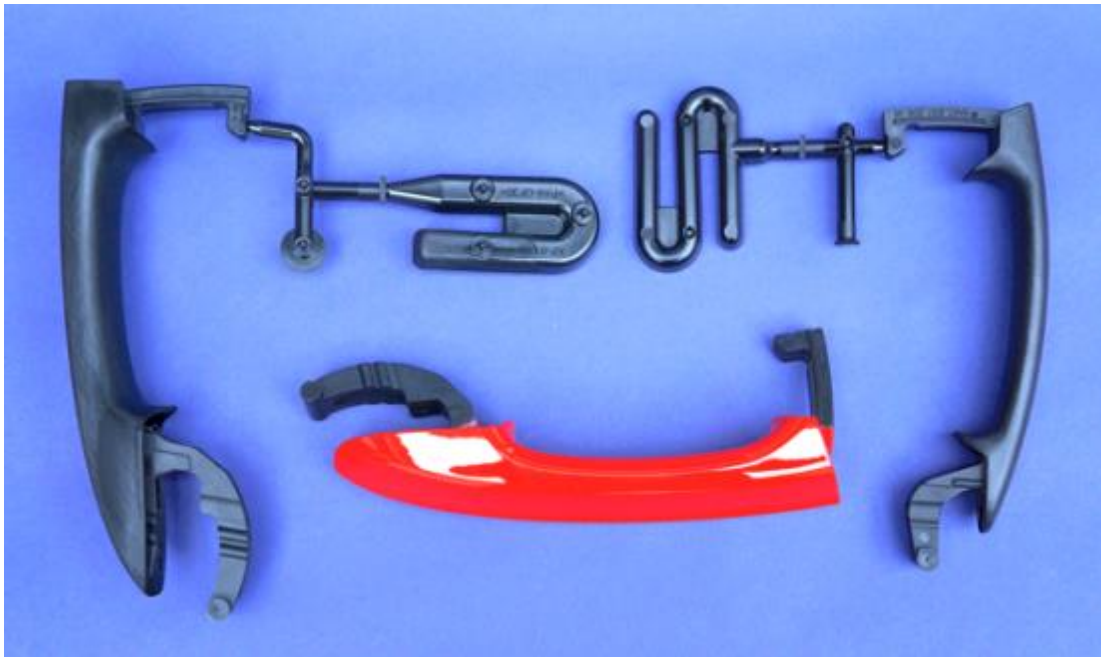


Photo author

Fig.3: Currently, about 1 million door handles are produced at WITTE Ostrov as hollow parts from PA6-GF 30. The picture above shows two handle models with the core material displaced by the nitrogen into the overflow cavity. The finished product, a ready-to-install handle with three layers of high-gloss painting, is shown in the middle.



Photo: author

Fig.4: The central gas supply system consists of a liquid nitrogen tank connected with two evaporation units, each combined with a compressor and a gas bottle buffer to stabilize the system pressure.



Photo: authorr

Fig.5: WITTMANN BATTENFELD AIRMOULD[®] control system able to address up to eight pressure control modules. The control system communicates with the machine via the EUROMAP 62 interface.



Photo: author

Fig. 6: Since, with only few exceptions, the handles are produced with 4-cavity molds, the gas flow to the machine is divided into four individual streams passing through four separate pressure control units.

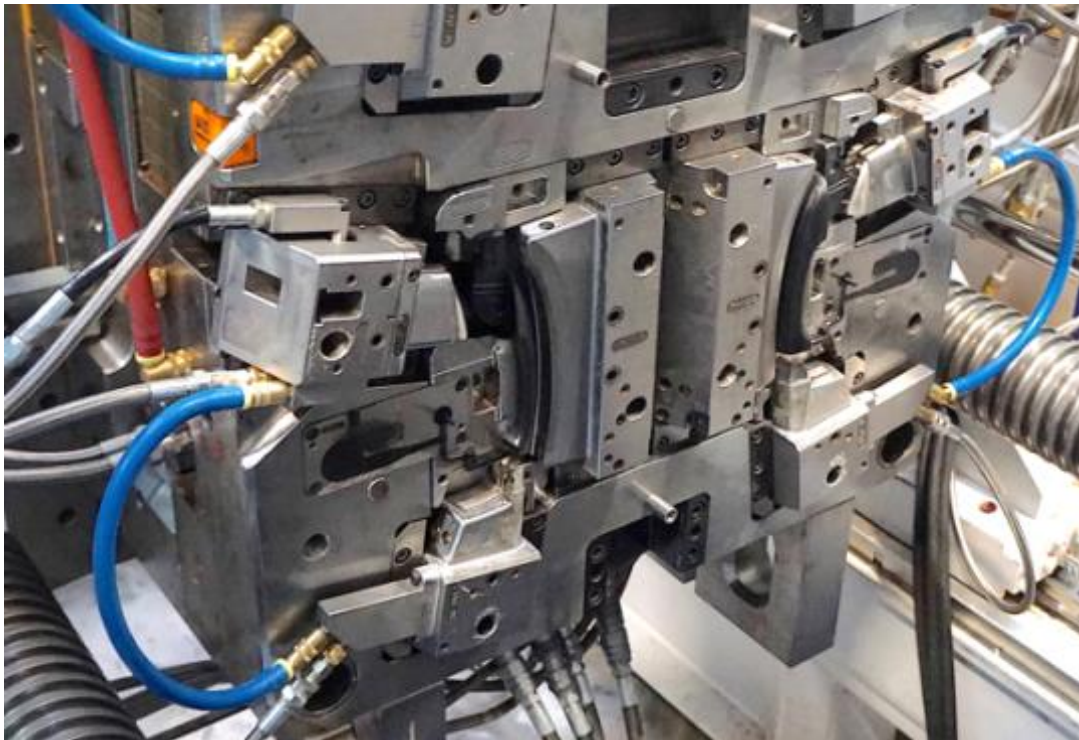


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Fig.7: Close-up view of a 4-cavity mold to produce door handles with gas injection technology



Photo: author

Fig. 8: Ing. Michal Slaba, Managing Director of WITTMANN BATTENFELD CZ and Pavel Karas, Production Manager of Injection Molding at WITTE Ostrov, looking back on many years of successful cooperation.

About WITTE Automotive



WITTE Automotive with its corporate headquarters in Velbert / North Rhine-Westphalia ranks among the technology leaders in the area of closing and locking systems for automobiles. These can be found on doors, flaps and seats in cars of all major brands. Production takes place in Europe, at four locations in Germany, as well as in Sweden, the Czech Republic and Bulgaria. 5,200 employees realized more than 670 million EUR in sales in 2017. WITTE Automotive shows a global presence in the USA, Mexico, Brazil, India, China, Japan and Korea as a member of VAST, the Vehicle Access Systems Technology Alliance. With about 12,000 employees and about 1,700 million USD in sales, VAST ranks among the globally leading suppliers in this product segment.

By opening its second facility in the Czech Republic in 2016, WITTE Automotive has set new benchmarks with the most modern production plant worldwide for painted external door handles in Ostrov.

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About WITTMANN BATTENFELD



WITTMANN BATTENFELD is a company of the WITTMANN Group with its corporate headquarters and production plant in Kottlingbrunn / Lower Austria. Its corporate focus lies on plastics injection molding technology and covers the entire range of machinery from micro injection molding machines with 5 tons clamping force up to large machines with 2,000 tons clamping force. Its product portfolio is rounded off by extensive additional technology packages, such as equipment for multi-component, foam or composite fiber injection molding. In combination with the range supplied by the WITTMANN Group, a leading manufacturer of robotics and peripheral appliances for materials handling, it is able to supply complete, turn-key injection molding plants including Industry 4.0 data networking.

More information on www.wittmann-group.com