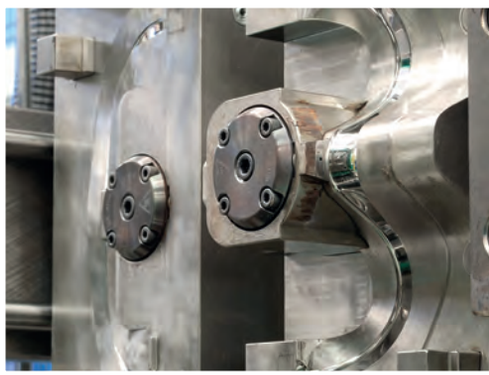
EWIKON

Customer information from **EWIKON Heißkanalsysteme GmbH**

Hotline

May 2015

Enhanced efficiency



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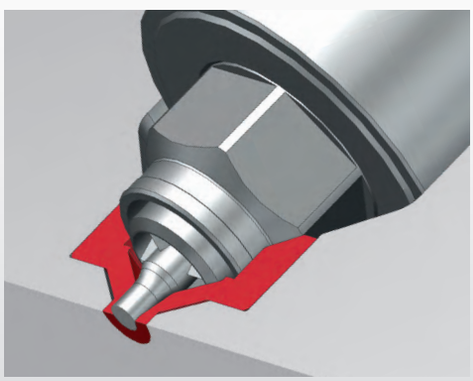

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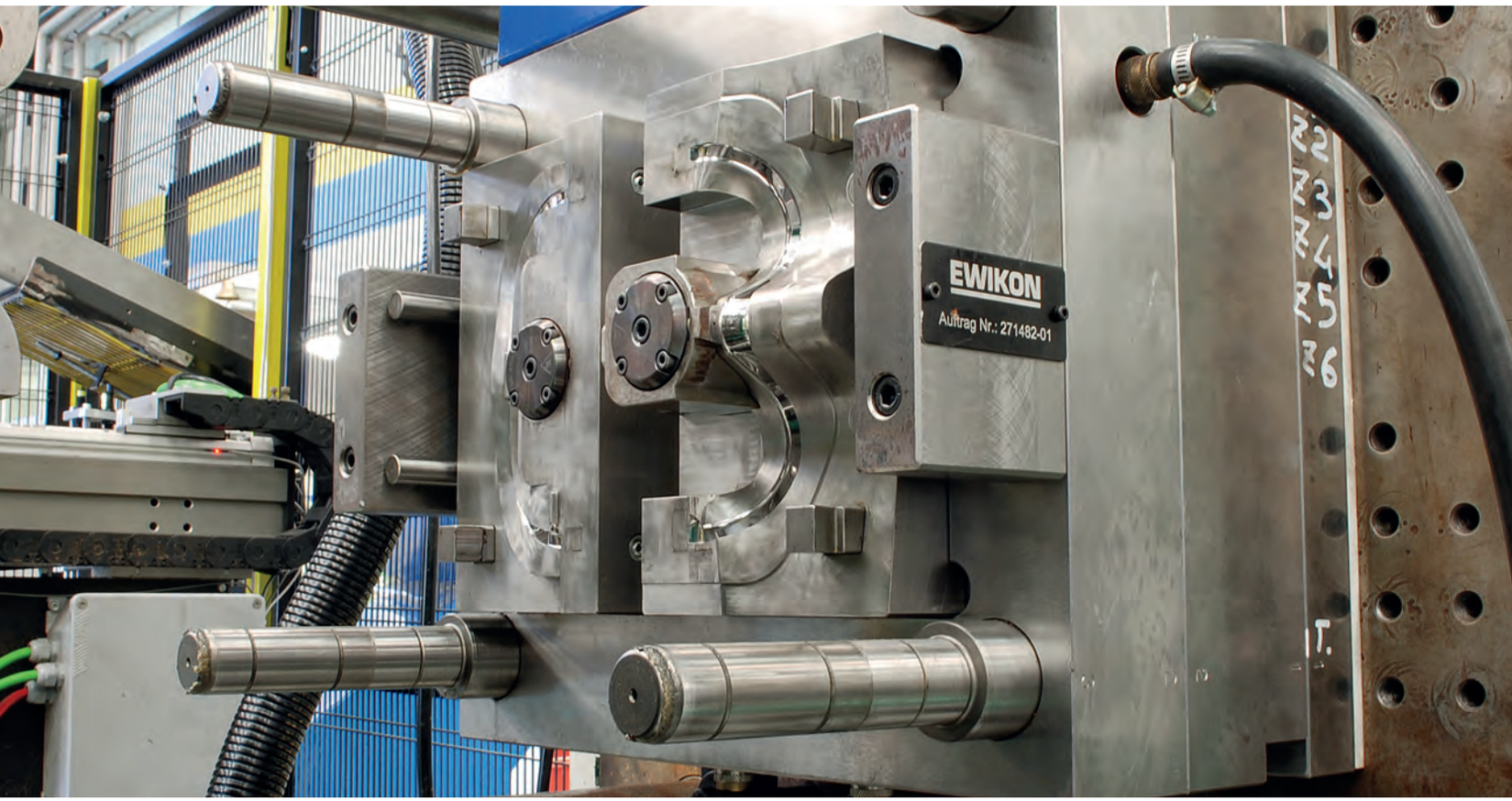
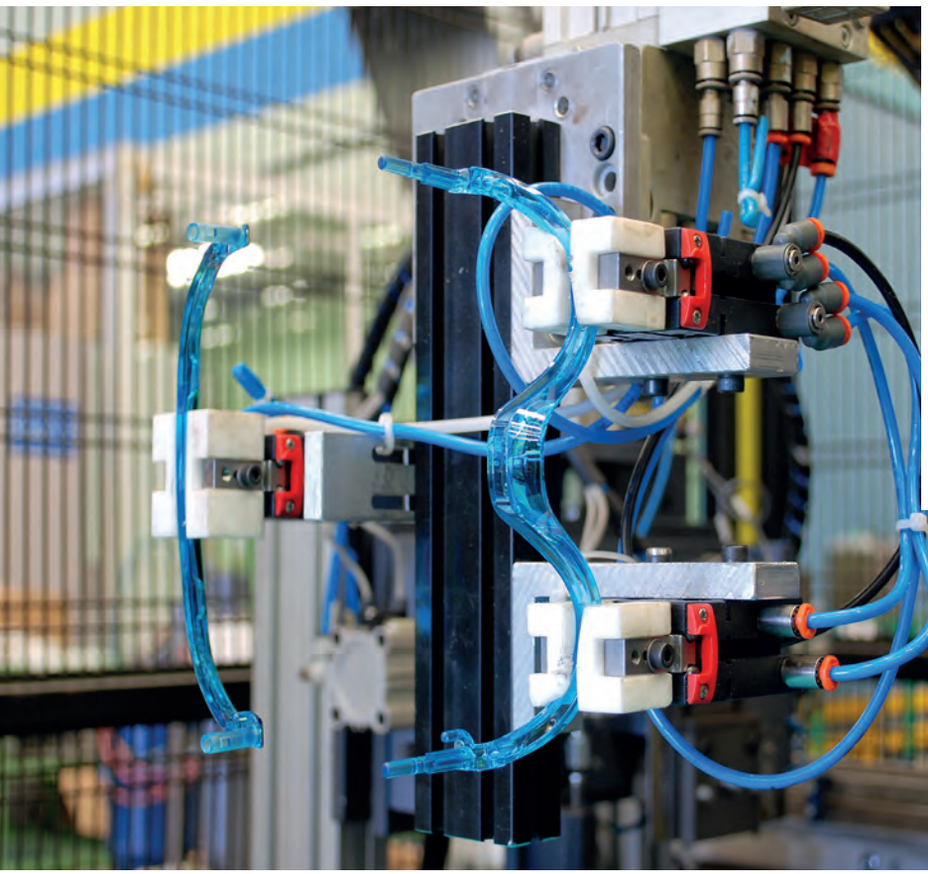


Hotrunner mould enhances efficiency for diving mask production

The market for stylish sporting goods is a price sensitive one. An efficient production is decisive to profitably and successfully compete here with a product manufactured in Western Europe. For the production of the frame parts for a new diving mask from Tribord, a private brand of the Decathlon Group, the Italian injection moulder AR Group - Plastic Division trusts in a new direct side gating hotrunner mould designed by mould maker Linea Stampi.

AR Group - Plastic Division is a one-stop supplier to a variety of important customers from different industrial sectors. Almost all components of the Tribord diving mask such as frame parts, lenses and the liquid silicone rubber skirts are produced, assembled and packed in the Sulbiate plant in Northern Italy. The strap is the only purchased part. Since the new diving mask is positioned in the lower price range the challenge was to establish a profitable production and at the same time to fulfill the high customer requirements. Here first of all an attractive, upmarket outer appearance is important. The polycarbonate frame comes in transparent or opaque high gloss finish in the up-to-date trend colours which are changed for every season. Flaws like minor air entrapments or flowmarks are not accepted. Furthermore, Tribord demands a high mechanical stability which has to be verified by load tests as well as a flexible just-in-time supply of the quantities and colours needed.

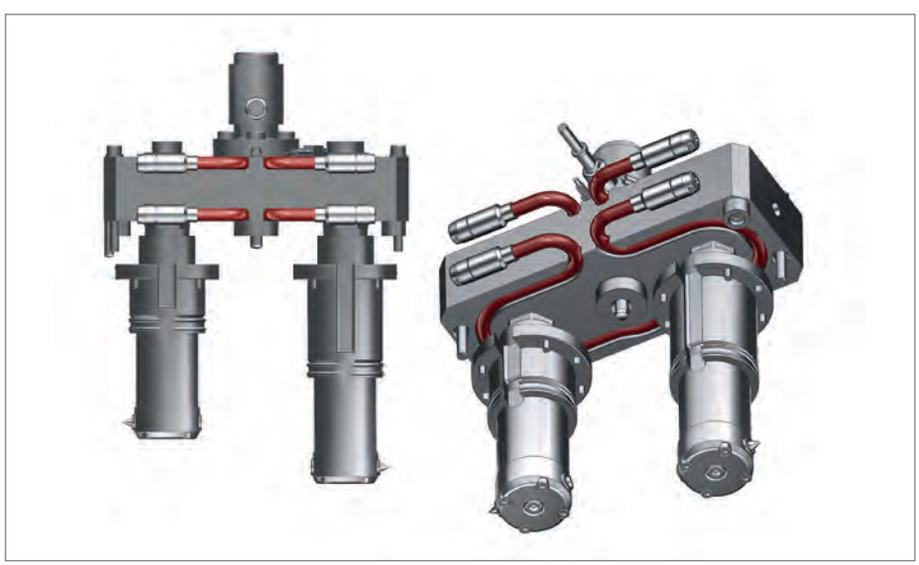


■ The Tribord diving mask comes in a variety of trendy colours changing every season (above)

■ The finished frame segments are picked up by a handling system (left)

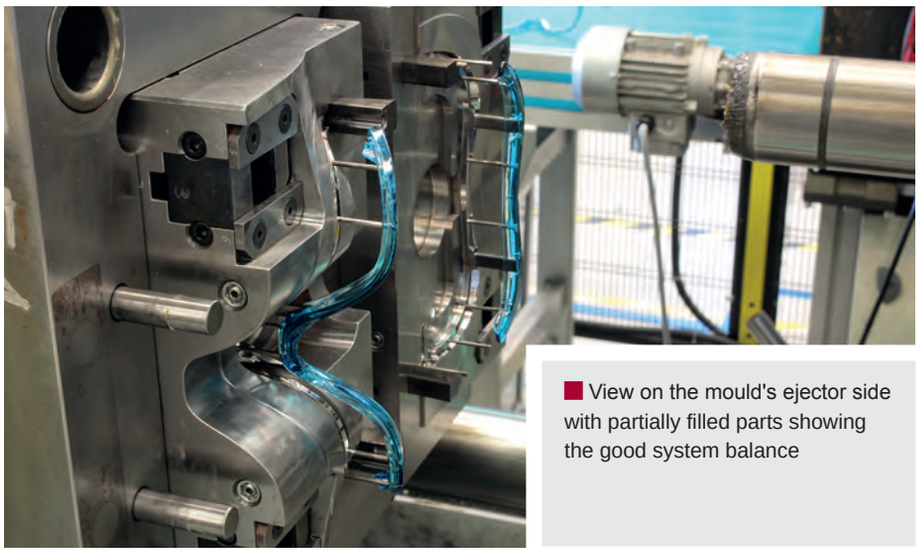
During the project planning stage all production steps were analysed with regard to efficiency and potential cost saving. Experiences with another diving mask version already produced in-house as well proved to be helpful here. “The end assembly of the soft and hard components of a diving mask requires many manual operation steps”, Fabrizio Gianni, project manager at AR Group - Plastic Division explains. “This does not leave much room for reducing costs. So we had to increase the degree of automation as well as the process efficiency for the production of the thermoplastic and liquid silicone parts. Our aims for the frame segments were to produce them with an utmost small scrap rate and short colour change times. At the same time it was important to avoid subsequent work steps and to operate the machine with a minimum of staff.”

The frame assembly is made of Lexan 123R and consists of an upper and a lower segment with different shot weights of 9.5 g and 11.1 g. During end assembly these are irreversibly connected by plugging them together. Since the segments are always required in pairs and considering the medium quantities needed Plastic Division and mould maker Linea Stampi decided to build a family mould. “The other diving mask is produced with a family mould as well but it uses coldrunner technology”, says Giuseppe Lissoni, co-owner of Linea Stampi, “for the new mould we decided to make no compromise and to build a full hotrunner solution. Otherwise it would have been not possible to fulfill the requirements.”



■ The hotrunner system features two HPS III-MH200 nozzles of different lengths with one tip each

Of course designing a hotrunner family mould is much more complex regarding mould stability and filling of parts. Thus, Linea Stampi decided to involve hotrunner supplier EWIKON already in the



View on the mould's ejector side with partially filled parts showing the good system balance

early design stage to ensure the best possible integration of the hotrunner components and to define the optimum flow channel layout. Of course, for even filling of the parts the gating points had to be placed in the middle of each segment. However functional and visible surfaces in that area made it difficult to find an appropriate position. EWIKON recommended direct side gating with HPS III-MH nozzles onto an easy-to-reach position at the backside of the frame segments. “Till then we were quite sceptical about direct side gating”, Giuseppe Lissoni remembers, “especially as this technology has very seldom been recommended by other hotrunner suppliers. But since we had recently successfully used the HPS III-MH nozzle in another application for a different customer and EWIKON was convinced about the potential even for a difficult-to-process material like polycarbonate we decided to go on with this concept.” Two radial HPS III-MH nozzles with one heat conductive tip insert each in lengths of 135 mm and 165 mm were used. The difference in length is explained by the position of the frame segments in the mould and the special geometry of the lower frame segment where the gating point is placed on the curved nose bridge. Considering the shot weights and the high-viscosity resin EWIKON decided to use the HPS III-MH200 version which is suitable for larger shot volumes. The nozzles are fed by a 2-drop linear manifold. It features the EWIKON element technology with streamlined flow channels without sharp corners or dead spots enabling very quick colour changes and allowing the problem-free processing of sensitive materials.

Since the shot weights differ by 15 % special attention was paid to the balancing respectively the filling behaviour of the system. The high demands regarding the part quality do not allow a high scrap rate neither caused by incomplete part filling nor by overpacking of the cavity with the lower shot weight which increases the risk for the formation of burrs. A Moldflow analysis conducted by EWIKON showed considerable deviations in filling between the two frame segments. This called for a rheological balancing of the system with the flow channel diameter and the gate diameter as correcting variables. The longer nozzle which gates the lower frame segment with the higher shot weight got a flow channel of 10 mm which is the same as used in the manifold. In the shorter nozzle the flow channel is reduced to 6 mm. At the same time the gate diameter of the shorter nozzle is reduced by 0.2 mm. These measures resulted in a perfectly balanced flow channel layout which allows an even filling of both frame segments.

The very compact hotrunner mould started production in spring 2014 and has been working reliably with a scrap rate close to zero. The frame segments are picked out of the mould by a handling system and put onto a conveyor belt which feeds them into separate transport boxes to be moved to the end assembly area. Compared to the diving mask version which is produced with coldrunner technology it was possible to increase the efficiency in several aspects. It is no longer necessary to remove the frame segments from the sprue by hand and – as often required – to trim and clean the gating points before finally assembling the parts. Further advantages are the material savings of 25 % and the higher efficiency of use of the operating staff. Thanks to the higher degree of automation regarding the parts handling the efforts for machine operation and supervision could be reduced by 40 %.

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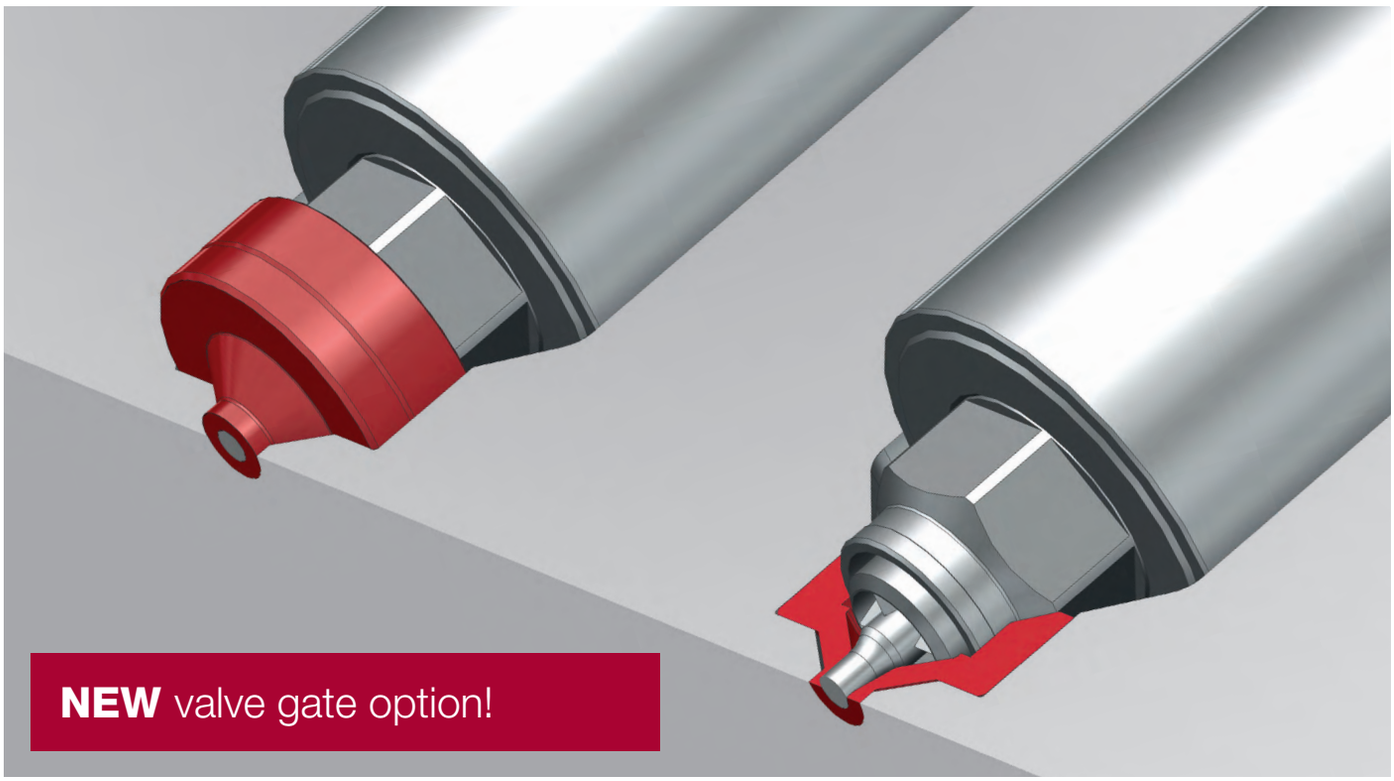
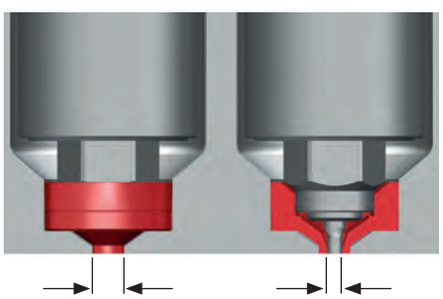


Gate exchange insert facilitates maintenance

When operating valve gate systems the gate area is especially liable to wear. Reasons are abrasion caused by high shear rates or reinforced materials as well as overload on the valve pin generated by belated closing which leads to deflection and causes a side movement. As a rule both types of wear are causing a loss of dimensional accuracy of the gate bore relatively soon. The consequence is a deterioration of the part quality for example the formation of flashes at the gating point. Even technical features like the permanent valve pin guide near the gate as used by EWIKON can only minimize the gate wear but in the long term not completely avoid it. Up to now the affected contour inserts or even contour plates had to be remanufactured and replaced. To avoid this cost-intensive and time-consuming work step EWIKON valve gate nozzles with flow channel diameters of 6 mm, 9 mm and 12 mm will soon be available with a new gating option. It consists of a gate exchange insert with high-precision machined inner contour and gate bore as well as a matching nozzle tip insert. The gate exchange insert is installed directly in the contour insert and can be replaced easily in case of wear. Depending on the nozzle size, the gate diameter and the part surface available for gating the gate exchange insert is available with different diameters Da in the gate area (see table).



Valve gate nozzle NV95258... / NV95259... , flow channel diameter 6 mm			
Gate Ø	0.8 mm - 1.0 mm	> 1.0 mm - 1.5 mm	> 1.5 mm - 2.0 mm
Ø Da*	2.8 mm	3.3 mm	3.8 mm

Valve gate nozzle NV95308... / NV95309... , flow channel diameter 9 mm			
Gate Ø	1.3 mm	> 1.3 mm - 2.0 mm	> 2.0 mm - 3.0 mm
Ø Da*	3.5 mm	4.2 mm	5.2 mm

Valve gate nozzle NV95408... / NV95409... , flow channel diameter 12 mm			
Gate Ø	1.5 mm - 2.0 mm	> 2.0 mm - 3.0 mm	> 3.0 mm - 4.0 mm
Ø Da*	5.0 mm	6.0 mm	7.0 mm

(*) Intermediate sizes available on request

EWIKON

Compact valve gating

Process-reliable processing of small POM parts with hotrunner systems

The process-reliable production of POM parts with hotrunner systems is challenging in many cases since the material is extremely sensitive in terms of temperature and residence time. This particularly applies to the homopolymeric type. For applications with a very high number of cavities and small shot weights EWIKON here is increasingly using multi tip nozzles with valve gate technology.

A customer from the furniture fitting industry already successfully uses several 128-drop hot halves for the large scale production of high-precision rollers made of Delrin® 100 with a shot weight of 0.15 g.

For this application an HPS III-MH 8-drop linear nozzle body is used which features 4 lateral melt outlets on each long side. Although the melt is fed from the side the part is gated in demoulding direction. The valve pins as well as the valve pin seals are installed parallel to the nozzle body in the cooled mould insert and are not in direct contact with any heated hotrunner components. This makes the system absolutely leakproof. To guarantee a simultaneous opening of all cavities and an even filling of the parts all 128 valve pins are fixed in a synchronous plate which is positioned between nozzles and manifold and actuated by 16 hydraulic drive pistons.
The decisive advantage of this concept is the optimized flow channel design with minimized residence time and pressure loss. Each nozzle body has a balanced 8-drop distribution already integrated. Therefore, only a 16-drop manifold is needed to realize a very compact 128-drop mould. This design results in very short flow paths. A comparable conventional system with the same number of cavities would require a considerably more complex manifold with a long total flow path length. By using the multi tip technology the residence time in the hotrunner system can be reduced by more than 40 %.

Another advantage is the high thermal stability. Due to its relatively large mass the nozzle body provides a stable and homogeneous heat flow to the gate. The control expenditure is reduced as well. Each nozzle body requires only one control zone. Including adapters between nozzles and manifold to bridge the synchronous plate 39 control zones are sufficient to operate the 128-drop mould. Furthermore, the compact system design minimizes the heat loss by reducing the contact points between hotrunner components and mould. This makes the system very energy-efficient. The energy consumption is 47 % lower compared to a conventional system.

The part: high-precision roller for the furniture fitting industry with a shot weight of 0.15 g

HPS III-MH valve gate technology - product features

- Lateral melt feed, gate positioned in demoulding direction
- Valve gate technology with synchronous plate actuation
- Fully balanced flow channel layout in the nozzle body
- Valve pin guides and seals installed in the cooled mould insert for leakproof operation

Extended production area for optimized mould plate manufacturing

Horizontal milling machining centres (above) and portal grinding machine (right) for the production of mould plates

EWIKON has further invested in extending the room and machine capacities at the headquarters in Frankenberg by building an additional 2,000 m^2 low energy hall for production and technical administration. Thus, the total production area now covers more than 6,000 m^2. Increasing the number of machines the main focus is placed on a production line for the efficient production of large mould plates. This is due to the fact that there has been a growing demand for complete hot halves with corresponding plate sizes. Two new 5-axis horizontal milling machining centres are now available for the rough-machining and finishing process of mould plates of up to 1,250 mm. A portal grinding machine for parts up to 2,500 mm x 1,500 mm is used to grind the plates between the milling processes. Chips and abrasive dust are removed from the finished mould plates which are dried with compressive air before being assembled after a final inspection.

At the same time, extending the production space was an opportunity to further optimize production logistics by shifting manufacturing areas. In the course of these activities also two storage lifts were installed to store raw material and small parts.

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