

Hotline

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Process-reliable integration – Hotrunner solution for a fully automated automotive application

By fully automizing the production of a connector plug for an automotive seat adjustment motor the Italian mould making and injection moulding specialist O.C.S.A. in Creazzo (VI) has considerably increased the productivity compared to standard production methods. The plastic-metal composite component is insert moulded and consists of reinforced PA 6.6 and a copper alloy. The close cooperation with EWIKON starting at the early stage of the project allowed the process-reliable integration of a full hotrunner system for side gating. This significantly contributed to the raise of productivity.

Considering the customer's very high annual requirement O.C.S.A. decided to set up a manufacturing cell with an ambitious maximum production capacity of 7,500,000 parts per year where all production steps are fully automated. This includes feeding, cutting and bending the metal contacts as well as overmoulding them with the plastic component and a 100% control of the finished parts. The aim was to gain maximum productivity and at the same time to keep the sizes of machine and mould at a minimum to allow the most space saving integration of the manufacturing cell and all required handling systems on the production space available. The injection mould with full hotrunner system works in the centre of the production line on a compact Engel insert 45 injection moulding machine with vertical clamping unit.

The part consists of two metal contacts with different shapes which are made

from a tin-coated copper alloy. They are embedded in a plastic housing by overmoulding them with PA 6.6 reinforced with 30 % glass fibre. According to the strict quality standards in the automotive industry the customer demanded an absolutely precise positioning of the metal contacts in the connector plug as well as a high dimensional stability of the plastic housing. The part weight is 3.5 g. Because of its geometry the part can only be gated from the side. "Up to now comparable parts have often been produced in low cavity moulds by using coldrunners", explains Marco Milan, owner of O.C.S.A., "so we decided to go for a solution which would help us to gain significant advantages in productivity and efficiency compared to potential competitors. Thus, right from the project start our key requirement was to integrate a full hotrunner side gating solution into the production process. Considering the expected large output as well as the fact that the material cannot be recycled we had to avoid any kind of sprue to save material costs. Furthermore, the removal of sprues would have required additional peripheral equipment and a more complicated process control."

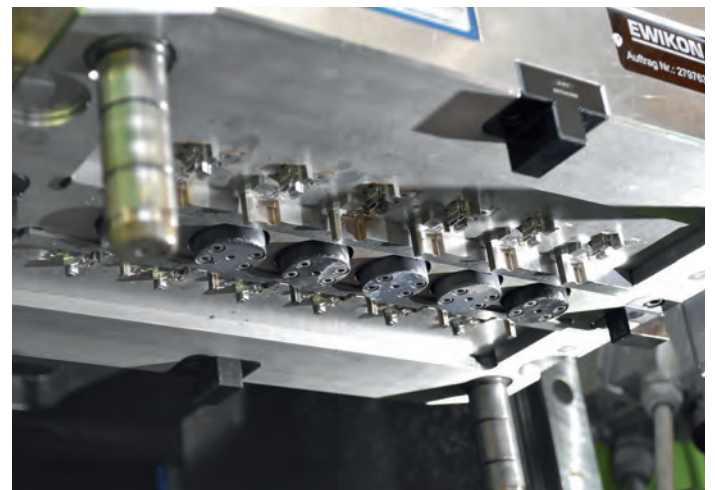
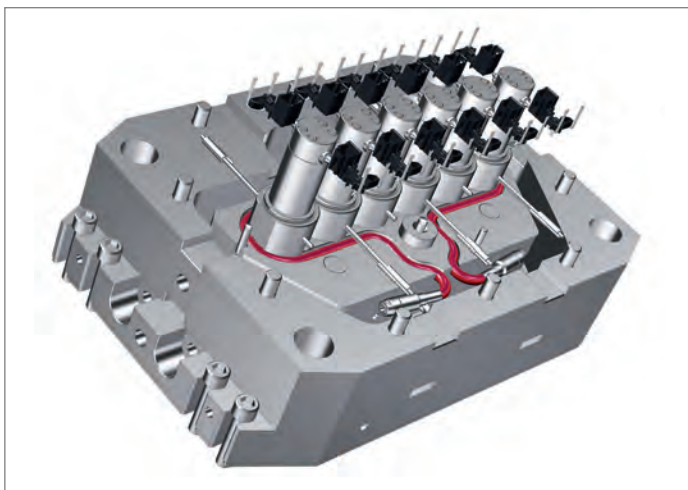
A compact 12-drop mould with a size of 396 mm x 296 mm with the parts arranged in two rows proved to be the ideal configuration for the machine size used. EWIKON as a specialist for side gating was first choice for supplying the matching hotrunner solution. Six radial



■ The part: connector plug with two metal contacts embedded in a housing made from PA 6.6 with 30% glass fibre reinforcement. The part is gated from the side.

HPS III-MH nozzles with a length of 60 mm are arranged in a row with flush mounted nozzle bodies which have been additionally flattened so that a distance of 45 mm between the cavities could be achieved. The distance between the two cavity rows is 50 mm. Each nozzle features two oppositely arranged wear-resistant heat conductive tip inserts. The melt bearing pressure tubes of the nozzles are directly heated by coil heaters. This enables a very stable heating with minimized loss resulting in an even temperature profile along the whole length of the nozzle. The fully balanced manifold system is equipped with streamlined direction elements for smooth melt flow. "No other hotrunner supplier except EWIKON was able to offer a solution which allows us to realize the cavity layout we

requested and at the same time is suitable for processing the demanding reinforced resin", says Marco Milan. "We were especially impressed by the way EWIKON approached this challenging application with a realistic evaluation of the potentials but also limits of their technology. Beside that there was a very close cooperation from the early stages of the project on and EWIKON provided excellent support with moldflow analyses and material tests on short term." As a result of these tests EWIKON decided to use MH200 nozzles which are designed for larger shot weights. This nozzle type features an even higher thermal performance and stability and furthermore has enlarged flow channel diameters. Thus, the shear rate in the system can be kept small which reduces the wear caused by the reinforced



■ Hotrunner system with 6 HPS III-MH200 nozzles arranged in a row with flush mounted flattened nozzle bodies (left) and view onto the hot half mounted on the machine (right). The easy accessibility of the nozzles for maintenance work is clearly visible. For replacement or cleaning of the heat conductive tip inserts only the end cover flange of the nozzle has to be deinstalled.



Fully automated production

- 1 Filling up of the collector stations with the two contact versions. In the foreground on the right hand side the placement handling is visible. Placed in the background are the die-cutting and bending stations.
- 2 Injection moulding section with mould half in removal and loading position. The placement handling inserts the metal contacts for one cavity row into the mould.
- 3 100% control of the finished parts by an optical measuring device.



resin. Nevertheless, of course wear is omnipresent during operation and requires the periodic replacement of components. Here the very maintenance-friendly design of the EWIKON system proves to be a big advantage. The tip inserts which are mainly subject to wear can be cleaned or replaced from the parting line with only minimum downtime and without the need to dismantle the mould.

Both versions of the metal contact are delivered pre-cut on rolls. In the manufacturing cell they are fed into

two processing stations which are arranged in parallel. Each processing station has a handling system placed at the end. The contacts are die-cutted, bent into shape, then picked up by the synchronously working handling systems and placed into collector stations. Six of these are arranged on a rotating plate. When filled up each collector station contains 6 pairs of contacts – the complete filling for one cavity row in the mould. It is picked up by the placement handling for the mould, checked for complete filling by an optical sensor and transferred into the injection moulding section. Here - in order to achieve the best possible cycle time - O.C.S.A. works with two identical mould halves which contain the ejector system and are fixed on a rotating plate. The first mould half turns into moulding position, the mould closes and the contacts are overmoulded with plastic. At the same time the second mould half is positioned in the removal and loading position. First, the removal handling takes out the finished parts from both cavity rows at once, supported by the ejector mechanism. It places the parts in the control section where they undergo an 100% optical checking procedure and are then collected in contain-

ers. Directly after the removal handling has picked up the parts from the mould the placement handling begins to load the cavities again in two working steps by inserting one row of contacts at a time.

Even though O.C.S.A. decided not to build a test mould the production cell went into production on schedule. Only minimum fine adjustments were required. The result is a perfect interaction of injection moulding technology, mechanical forming and handling robotics. With a cycle time of 24 s for the overmoulding process and synchronized peripheral equipment the required production figures can be easily realized. At the same time the direct gating with hotrunner allows a significant saving of material. The trouble-free operation of the production cell gives an impressive example for the process-reliable integration of precision injection moulds with modern hotrunner technology into complex fully automated applications even when demanding resins are processed.

Contact

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**NEW!**

VDC Valve Drive Control

The solution for the precise control of valve pin movements when gating sequentially. Suitable for hydraulic or pneumatic valve gate drive units.

Option: valve cluster

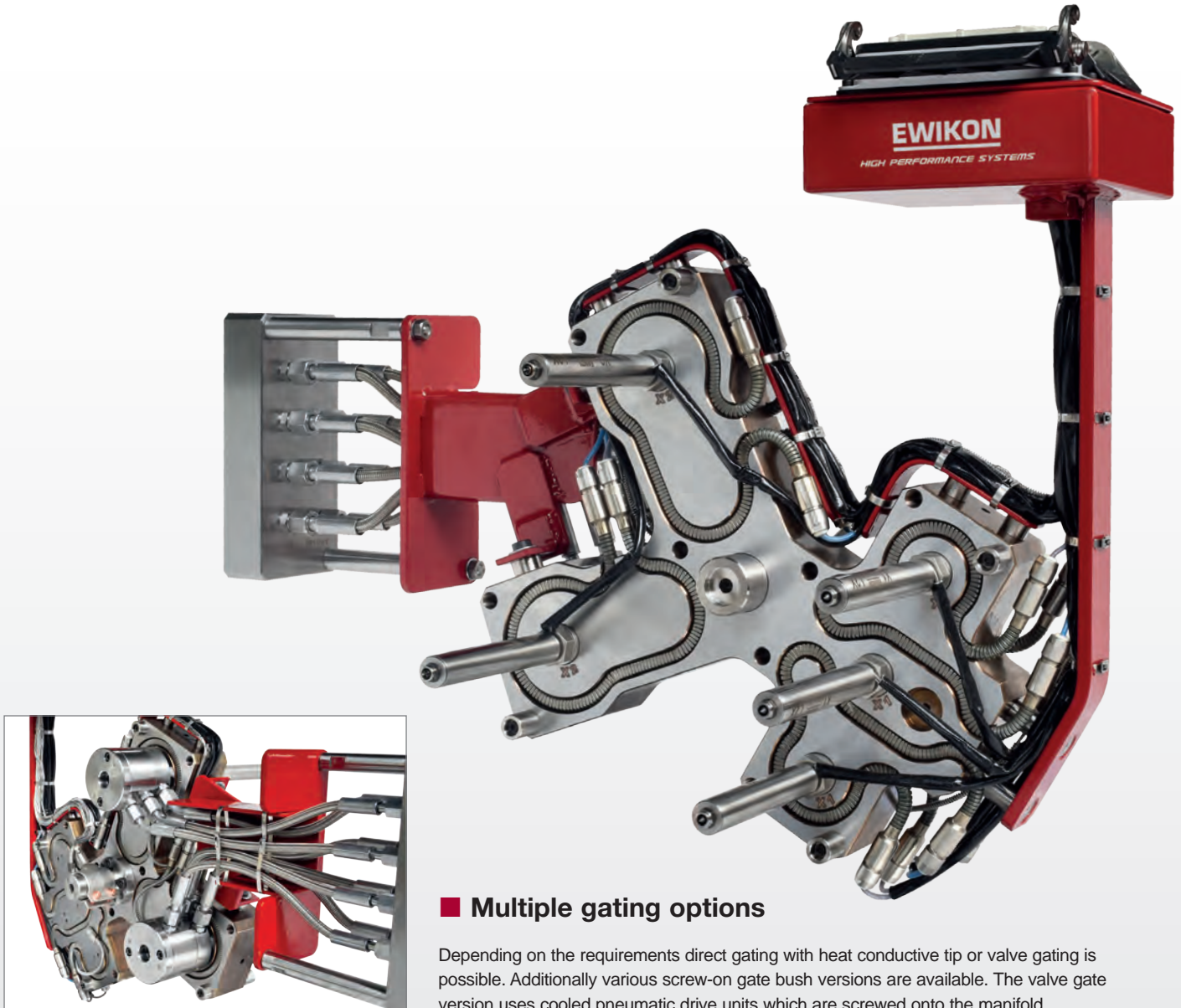
For operation of pneumatic systems EWIKON offers a pre-configured valve cluster as an option. It comes either with four or with eight readily wired electromagnetic valves and also includes all connections for pneumatic supply as well as the connector plug for the VDC controller. The valve cluster is designed for operating pressures up to 16 bar and is fixed at the injection moulding machine in proximity to the mould. Thus, the pneumatic supply lines can be kept short and an operation with a minimum loss of pressure is possible.

The compact **VDC** (Valve Drive Control) control unit is designed for the precise operation of up to eight drive units when gating parts sequentially. The comfortable touch screen control allows the individual setup of the opening and closing time for each valve pin. Furthermore each valve pin can open three times within an injection cycle. The response time is 2 milliseconds. The trigger signal for the valve pin movement is provided by the injection moulding machine optionally as a digital signal (for example start of injection), an analogue signal (for example screw position) or a combination of both signal types.

If drive units with integrated position monitoring sensors are used they can be connected with the controller by using the signal input. When faults in valve pin operation are detected an

alarm signal is sent to the injection moulding machine. The controller is available in two version for operation of four or eight drive units which have electromagnetic valves integrated into the supply lines. It can operate both electromagnetic valves for hydraulic and pneumatic drive units. Since the standard connector features separate outputs for opening and closing either valves with two solenoids or valves with one solenoid and spring return can be used.

With the integrated recipe management it is possible to define up to 50 mould settings, to save them and - if required - to transfer them to an USB stick. Furthermore, the internal memory of the device can also be accessed from a computer network by using an ethernet cable.



■ Multiple gating options

Depending on the requirements direct gating with heat conductive tip or valve gating is possible. Additionally various screw-on gate bush versions are available. The valve gate version uses cooled pneumatic drive units which are screwed onto the manifold.

L2X

Drop-in hotrunner system

Superior thermal behaviour and new connecting technology - the next generation of the EWIKON L2X system sets new standards in performance and ease of maintenance.



■ Fully balanced manifold technology

L2X manifold systems use the fully balanced EWIKON element technology with streamlined flow channels without sharp corners or dead spots.

■ Powerful heating technology

The screwed-in nozzles feature coil heaters which are directly integrated into precision-machined cutouts in the melt bearing pressure tube. This design enables a very stable heating with minimized loss resulting in an even temperature profile along the whole length of the nozzle.

■ Easy-to-maintain connecting technology

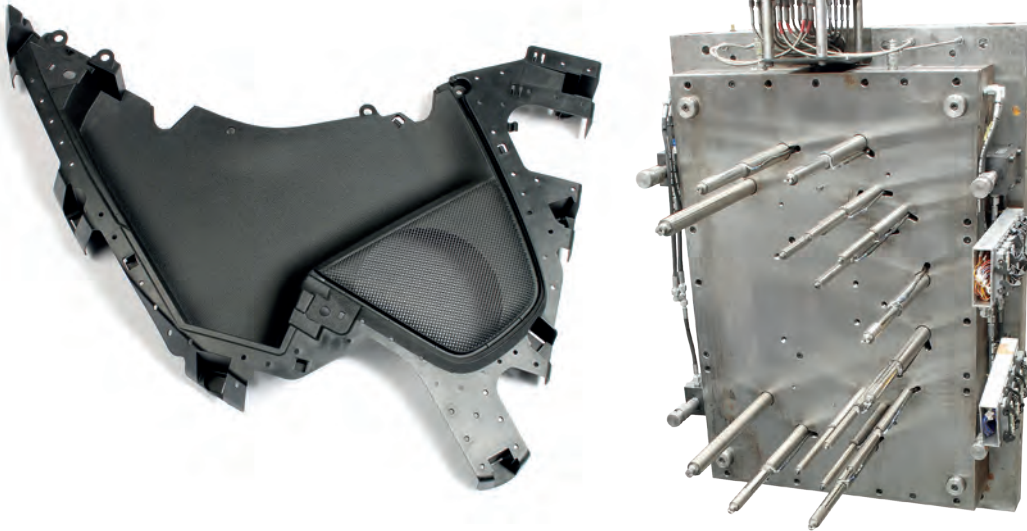
The innovative connecting technology guarantees an absolutely leakproof connection between nozzles and manifold. The screw mechanism features a connecting nut which allows the nozzle to rotate freely and thus the connection cables to be precisely aligned with the cutouts in the mould. The end position is then fixed by tightening the connecting nut. In case of maintenance work it is possible to quickly and easily deinstall the nozzle and – after for example replacement of heater or thermocouple – to install it again in exactly the same position.



Product features + Benefits

- Completely assembled and wired system, easy integration into the mould construction
- High heating power due to direct heating of the melt bearing pressure tube with coil heater. Even temperature profile along the whole length of the nozzle. Suitable for technical resins and reinforced materials
- Connecting technology allows precise positioning and - in case of maintenance - repositioning of nozzles and connection cables in the mould. This is ideal for applications where contoured screw-on gate bushes are used, for example in the automotive industry
- Available with flow channel diameters 6 mm, 9 mm, 12 mm and 18 mm
- High production reliability due to leakproof screw connection between nozzles and manifold
- Direct gating with heat conductive tip or valve gating with cooled pneumatic drive units

Large systems for automotive speaker grilles



The production of automotive speaker grilles follows its own rules. The parts must feature a high mechanical stability, the design of the fine grille structure has to be specifically adapted to the interior of the car to achieve a perfect acoustic pattern and all visible surfaces have to be flawless with a pleasant feel. The typical materials used are POM, PC-ABS or PA6-ASC blends. The percentage of multi-component applications is steadily growing. One of the few companies which have specialised in the production of these demanding parts is Bernd Lindecke Werkzeugbau GmbH (www.lindecke.de) in Bad Salzungen, Germany. With all large automobile manufacturers as customers Lindecke produces both large moulds for the production of door panels with integrated speaker grilles as well as smaller moulds for example for the production of tweeter covers. EWIKON supplies hotrunner systems in different versions. Smaller grilles are produced with open nozzles, larger grilles and complete door panels require sequential valve gating. The nozzles come in lengths up to 600 mm, the typical flow channel diameters are between 9 mm and 18 mm. All moulds have one special characteristic. To fulfil the surface quality requirements the

ejectors are placed on the hotrunner side. Ejector and gating points are positioned on the supporting frame structure on the back-side of the grille. One grille can have up to five gating points and - due to the fine structure - sometimes needs up to 100 ejectors to be demoulded without the risk of damage. Thus, the hotrunner nozzles must be as compact as possible to fit into the constricted space. Here the direct heating of the melt bearing pressure tube with coil heaters proves to be an advantage. It allows a generally slim design and furthermore guarantees a very stable and even heating even for the large nozzle lengths used.

On the manifold side the EWIKON element technology enables a compact flow channel layout on several levels. The technology is particularly suitable for a cost-efficient pre-balancing of moulds with asymmetrical gating point positions, for example for door panels with a gate cluster in the grille area and additional gates in more distant positions. The differences in pressure between the nozzles can be simply and precisely adjusted by the length of the flow paths instead of using expensive melt pressure control systems which take influence on the flow channel diameter.

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