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Jigsaw casing in one moulding operation

**The tool and mould making company Fassnacht Werkzeug-/Formenbau manufactures the 2-C mould for Bosch /
Günther provides the individually adjusted hot-runner system**

Frankenberg. A company which takes part in Germany's nation-wide "Excellence in Production" competition five times and reaches 2nd place in 2004 and 1st place one year later in the "external mould maker with fewer than 100 employees" category, becomes the overall winner in 2007, and attains the excellent result of 2nd place in 2009 and 1st place in 2010 must be capable of producing extraordinary and top-quality solutions in mould construction also. Building on 23 years of successful tool and mould making despite the ever-rising world-wide competition, above all from low-wage countries – well-founded expertise, competence and state-of-the-art production technologies combine and interact at Fassnacht tool and mould making to enable this high level to be maintained. At the same time, Günther's hot-runner technology is used innovatively again and again.

Wolfgang Fassnacht, founder and proprietor of Fassnacht tool and mould making, describes the company's field of activity in this way: "As pure mould makers, we have specialised in highly complex injection moulds and work with such sophisticated processes as, for example, multi-component and thin-walled technology and film in-mould decoration. The broad experience we have amassed enables us to find the right solutions for the most complicated injection moulding parts."

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Two-component injection mould for Bosch power tools

The two-component injection mould for a jigsaw was also produced by Fassnacht Werkzeug-/Formenbau for the Bosch-Group, namely for the Bosch power tool segment. In addition to producing the moulds for the Bosch logo, Fassnacht also manufactures a two-component hedge-clipper handle and further moulds for manufacturing other 2-C casings for jigsaws. Wolfgang Faßnacht comments: "Bosch is one of our oldest customers. We have already been working with various divisions in that group for 22 years and we have been co-operating with the Bosch power tools division since 2008."

The mould to produce the battery-driven jigsaw casing shell was designed as a 1+1+1+1-cavity mould. This means that the hard component for the left and right enclosure sections is injected before the soft-component is added on the left and right. The movable half of the mould is turned by a turntable on the injection moulding machine. This allows a pair of shells and accordingly a complete jigsaw casing to be made in just one single operation.

Insert parts are overmoulded at the same time

Not only are two components combined in the mould to produce casing shells, several insert parts made of plastic and steel are included as well.

Wolfgang Faßnacht explains the production procedure as follows: "First, the Bosch logo (consisting of the lettering and the well-known "magneto armature in a casing" from the Bosch magneto) and a steel bush bearing are inserted into the 2-C turntable mould. The hard component is injected, the mould is turned and the soft-component areas required for perfect haptics are added on then. Thanks to its classic construction, the mould's maintenance requirements are relatively low and can therefore be taken care of by the injection moulding department which produces the casing shell."

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The hot runners and nozzles come from Günther

The basic body of the casing shell consists of a PA6 with a glass fibre content of 35%. The shot weight per nozzle amounts to 182 g for the shell on the left and 170 g for the right shell side. The injection is done directly through 2 nozzles, whereby the gates are 2 mm in diameter. Gating is central through the horizontal injection unit.

The TPE components are introduced into the mould decentrally opposite the operating side, i.e. from the rear of the machine, and out of a vertical injection unit working in the parting line. Two units are used solely for reasons of volume in order to be able to fill all areas the best way possible. However, only one manifold block, fed through two inputs, is used.

For the most part, the gating is direct here too, whereby each gate is 1 mm in diameter and the shot weights are between 2 and 5.4 g. Injection is much more complex in this area than when injecting hard components because different part zones have to be injected independently of each other. Wolfgang Faßnacht explains it in this way: "There was no other way of gating the soft component than directly onto the part because the diverse soft areas do not reach as far as the mould parting and therefore accessibility through the cold runner would be either impossible or very difficult. We have a total of eight soft part areas per shell. Five are easy to inject directly through the valve-gate nozzles but a second nozzle was used for one area because of the length of the flow path. The two remaining soft sectors are filled by means of the core-back process, whereby the cavity is expanded by pulling a slide and a second component is injected. The position of one of the TPE areas prevents either direct injection or gating to a second part. Our solution here was to inject onto a sub-runner and to fill this area by means of a sickle gate."

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Hot-runner nozzles with a tip (SHT type) for hard valve-gate nozzle processing to incorporate the TPE components

The first component, the fibreglass-filled PA, is injected through a Günther T manifold with a manifold height of 36 mm and two nozzles with a length of 100 mm. These are hot-runner nozzles with a tip and two-part shaft. The SHT-type nozzles are suitable for high-temperature applications and are screwed to the T manifold.

The second soft component is introduced into the mould through seven + seven type NMT-type valve-gate nozzles. This nozzle configuration is actuated by ENV3-S-type and ENV2-S-type single-needle valves. All nozzles are used in a special version of a valve-gate manifold, which is 56 mm in height and accommodates seven nozzles at a time.

Nozzle systems that are advantageous in terms of temperature management, wear and maintenance

Not only do the tapered outer contours of the NMT valve-gate nozzles and the two SHT-type nozzles with tip keep the heat loss at a low level, the two-part nozzle shaft made of a material combination of steel in the back part and a titanium alloy in the front section conducts very little heat also and consequently provides excellent insulation in the front shaft area. The result is a more homogeneous distribution of temperature in the nozzle and low losses of temperature between the nozzle and cavity.

All in all, this leads to higher thermal stability in processing and a more even distribution of temperature.

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In terms of hardware, the valve-gate nozzles allow the gate to close perfectly. The needle guides made of powder metallurgical steel have a hardness of approximately 60 HRC, are practically wear-free and therefore economical in daily use. Filled or abrasive materials can be processed easily too.

The innovative design of this contouring needle guide and the optimized valve gate needle permit a non-contact and wear-resistant gate closure. The needle guide plunges through down as far as the product, and sealing forms at the cavity plate.

The down-stroke depth of the individual shut-off needles can be readjusted while they are installed and this brings other advantages in terms of precision and cost effectiveness. The separation of needle guide and material tube in the nozzle allows an easy replacement of the guide as a wear part. Finally, the standardization of the components makes an economical solution attainable for all hot-runner designs.

All system components function excellently in interaction with each other

The special version of the valve-gate manifold is externally heated, which ensures an optimum flow of melt with a minimum loss of pressure. Special bushings protect the electrical connections from damage. Pressed-in heating ensures an optimum transfer of heat to the manifold and accordingly a homogeneous distribution of temperature. Various manifold variants are available – from partly or fully balanced or, as in this case, as customized solutions.

The hydraulically operated single needle valves close and open the needles sequentially in the nozzles and allow precise and reliable injection. Special holes in the mould clamping plate allow the down-stroke depth of the valve gates to be adjusted individually from the outside, which makes maintenance and the beginning of production easier and faster.

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The benefit Günther offers the Fassnacht tool and mould making company is an individually adjusted valve gate system.

The individuality which comes from the availability of an extremely wide range and the extensive service provided characterize the smooth co-operation between Günther Hot-Runner Technology and all its customers, not just Fassnacht. This made it possible to find a perfect solution with precisely adjusted manifolds, various open and valve-gate nozzles and high-performance single-needle valves for the specific conditions of the Bosch-2-C mould for the jigsaw casing. Wolfgang Faßnacht describes the co-operation as follows: "Our experience with Günther has always been positive so far. Günther supplies perfected and well-functioning technology. Furthermore, the 3-D data we need for designing is delivered promptly. Along with other factors, this gives us the necessary edge in rapidly implementing customers' wishes." This, in addition to the high degree of precision in the creation of moulds, is the decisive factor for a successful continuation of mouldmaking in Germany.

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Fassnacht Tool and Mould Making:

Wolfgang Faßnacht founded the Fassnacht tool and mould making company when he was a 25-year-old master toolmaker. The company grew constantly. Now, with 18 employees, it is in a position to develop solutions for all mould making requirements. "Made by Fassnacht" has made a name for itself in the industry in the meantime and customers come to Fassnacht's headquarters in Bobingen near Augsburg from a very wide range of sectors: from the automotive and medical sectors, from packaging and household technology and from the construction and electrical industries. Accordingly, the tools for the visible parts of the central dashboard and for the indicator lights on the side of the current BMW 3 series were also produced by Fassnacht as were a lot of the moulds for electrical appliances from Bosch.

Günther Hot-Runner Technology:

Günther Heisskanaltechnik GmbH, Frankenberg (Eder), has about 200 employees and 33 agencies in Germany and abroad. This hot-runner systems supplier provides components and systems to virtually all sectors of the plastics industry. The company's strategic focus is on developing and implementing customized solutions that offer high productivity and quality. The modular components from Frankenberg are so well-engineered that they also serve as the technological basis for all customized solutions. This means that a lot of requirements set by customers are comprehensively satisfied even by standard products from Günther.

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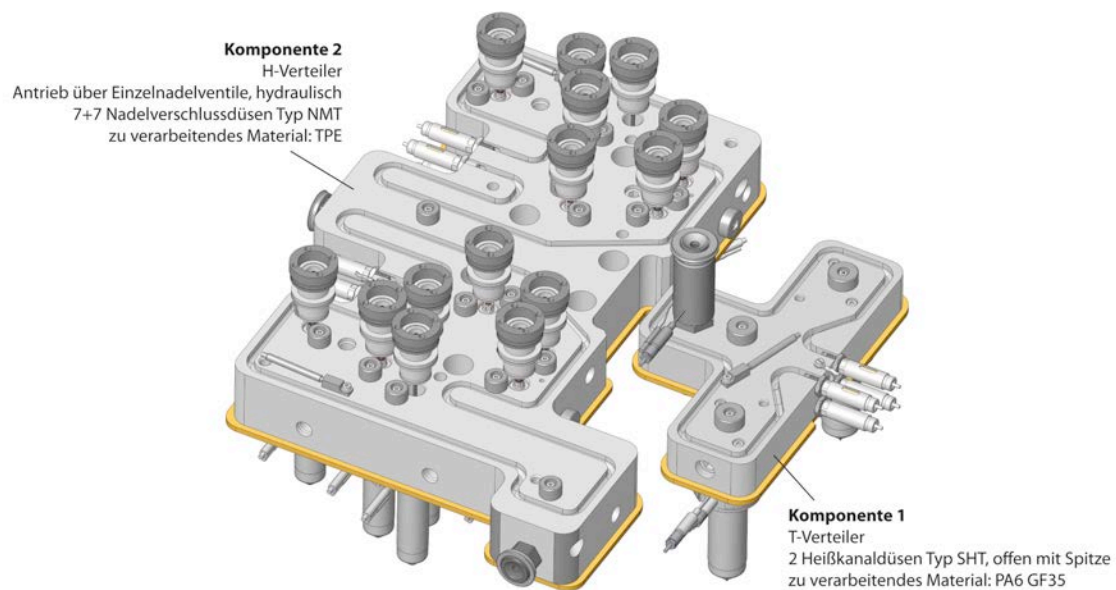
Picture caption: half shell of the casing for a Bosch jigsaw

Both the black, pleasant-to-hold TPE casing parts and also the components in the Bosch logo are clearly visible.



Picture caption: Inside view of the half shell with complex ribs and webs to stiffen the structure and inserts.

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Günther Heisskanaltechnik GmbH

Picture caption: CAD view of the complete Günther hot-runner system for the jigsaw mould.

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Picture caption: the advantages of the NMT valve-gate nozzles are their higher thermal stability during processing and a more even distribution of temperature.



Picture caption: finished product: the high-quality battery-driven GST 14.4 V-LI jigsaw from Bosch for professional use, as it appears on sale in shops. (Photo: Bosch/Fassnacht)