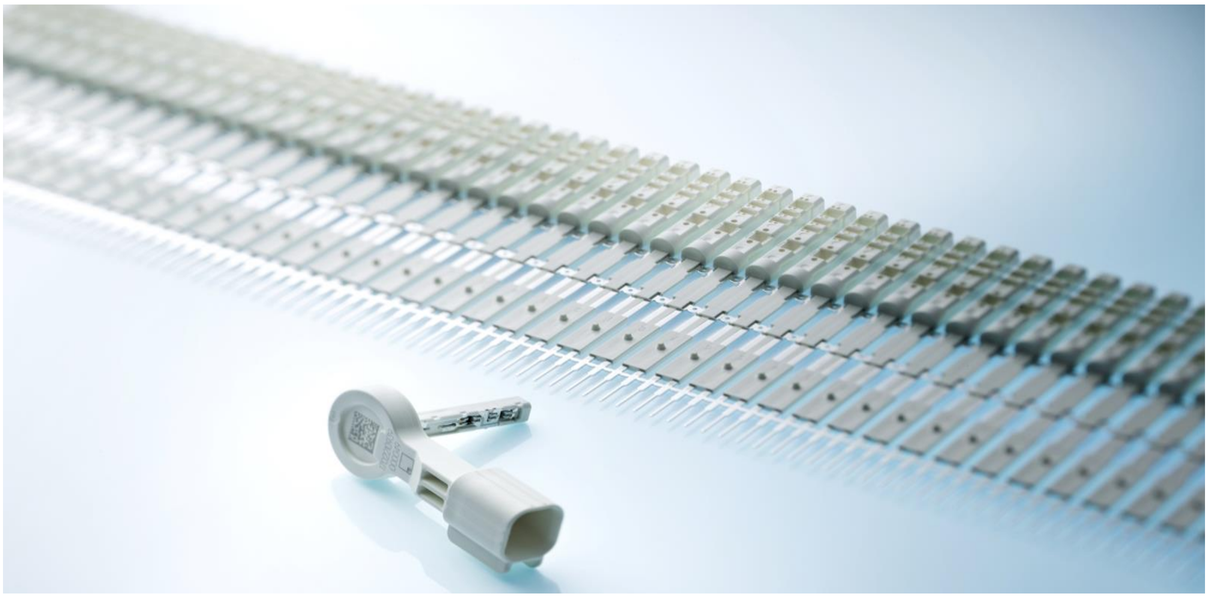
Valve gate technology:
Smallest dimensions for highest demands



Together with Leicht & Müller Syscotec from Remchingen, Heitec Heißkanaltechnik GmbH from Burgwald-Bottendorf developed a mould concept for the production of sensors in the automotive industry. The development focused on finding a tool concept that was as compact and cost-effective as possible for manufacturing the sensors, which are only 5.8 mm wide..

The sensors which are used to detect the level of liquids in vehicles consist of a tin-coated CuSn6 carrier which is over-moulded in two steps with Hostacom G3 N01 L (PP GF30+ 3% masterbatch). The carriers are located on an endless contact strip that is injected eight times per production step at a distance of only 8 mm. Special end customer requirements were a max. permissible overall warping of the sensors of less than 0.1 mm over the entire component length as well as a gate cosmetic without protrusions or particle formation.

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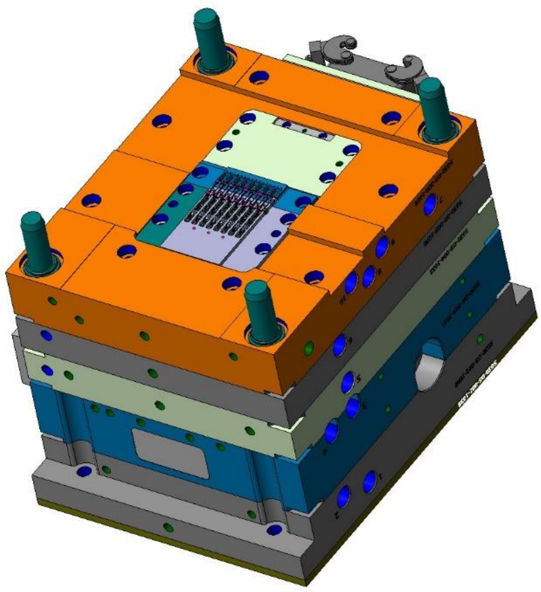

Nozzle side pre-moulded part

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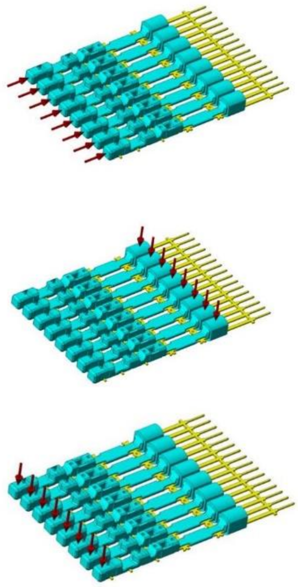
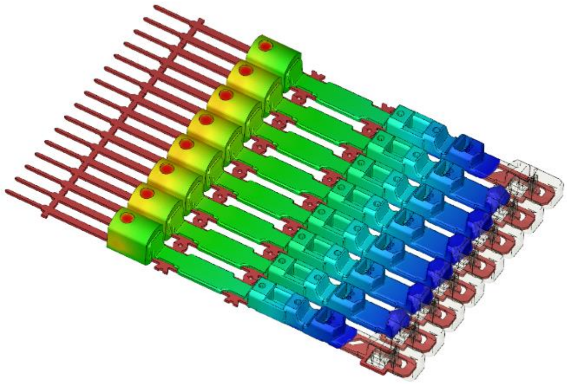
During the preliminary investigations, the best gating point position with regard to warpage and article filling was determined using various simulation methods. There were three variants to choose from - with variant 3 designed as an open gating system and variants 1 and 2 as a valve gate system.



Gating point variant 1 showed the best results in terms of warpage, article filling and pressure requirement. Initial concerns that filling problems or sink marks could occur due to the multiple wall thickness changes to the end of the flow path were not confirmed.



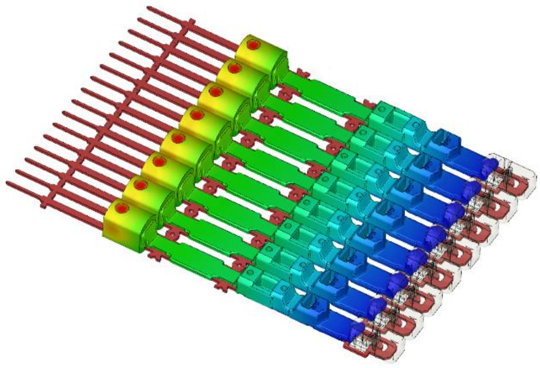


Figure 1 shows a clear shortage of the two outer cavities. By adding two additional, non-plastic-carrying nozzles (not shown) next to nozzle 1+8, the imbalance is compensated and homogeneous filling of all 8 cavities is achieved (Fig. 2).

To ensure a homogeneous temperature profile of the eight plastic-carrying nozzles, a dummy nozzle was placed at the beginning and end of each nozzle row. This is necessary because the distance between the nozzles is only 1 mm and the nozzles thermally influence each other in the process. Omitting the use of dummy nozzles leads to a thermal imbalance in the two plastic-carrying nozzles on the outside, which results in filling differences.

A Synchro-Valve drive with a pneumatic actuator was selected to drive the shut-off needles. In addition to the absolutely synchronous opening and closing of the needles, the Synchro-Valve drive ensures a highly robust mould design. Unlike known drive solutions such as lifting plates, there is no weakening of the nozzle side due to the hollow space behind the hot runner system in which the lifting plates move back and forth. The moving drive element measures only 13.5 x 90 mm and accommodates all eight shut-off needles. The housing and all other components of the Synchro-Valve system are positively connected to the mould and act like an additional support.

The sensor is manufactured fully automatically in several steps. First, the endless contact strip is overmoulded on a vertical injection moulding machine. In the following steps, the pre-moulded parts are cut, bent and separated. In the final step, the separated pre-moulded parts are transferred to a second mould and the connector heads are moulded on.

In order to handle the expected high quantities, the moulds were each designed with 8 cavities. The contact strip was to be moulded directly in order to avoid sprue separation or additional handling required to remove the intermediate sprues.

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Conclusion:

We knew that we would have to come up with a customised production concept because of the technical conditions and the high quality requirements on the part of the end customer. Another reason why we contacted Heitec was the pitch spacing of 8 mm, explains Thomas Keller, plant manager at Leicht + Müller. The cooperation of both teams during the project phase, during which no ideas were off limits, was exemplary. Solutions proposed by both sides were mutually evaluated, so that we were sure we had come up with the best concept.

As this was our first hot runner system from Burgwald, Heitec provided support during initial assembly and commissioning. This was followed by a hot runner-related training of our toolmakers and plastic processors. After implementation of the mould in the production cell, Heitec also supported the initial sampling. The mould and hot runner functioned smoothly from the first shot. The targeted production cycle time was already achieved during the initial sampling. In the meantime, production runs fully automatically in high quantities.

From the start of the project to the series run, everything went according to plan, sums up Thomas Keller. We look forward to further cooperation with Heitec.

In cooperation
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