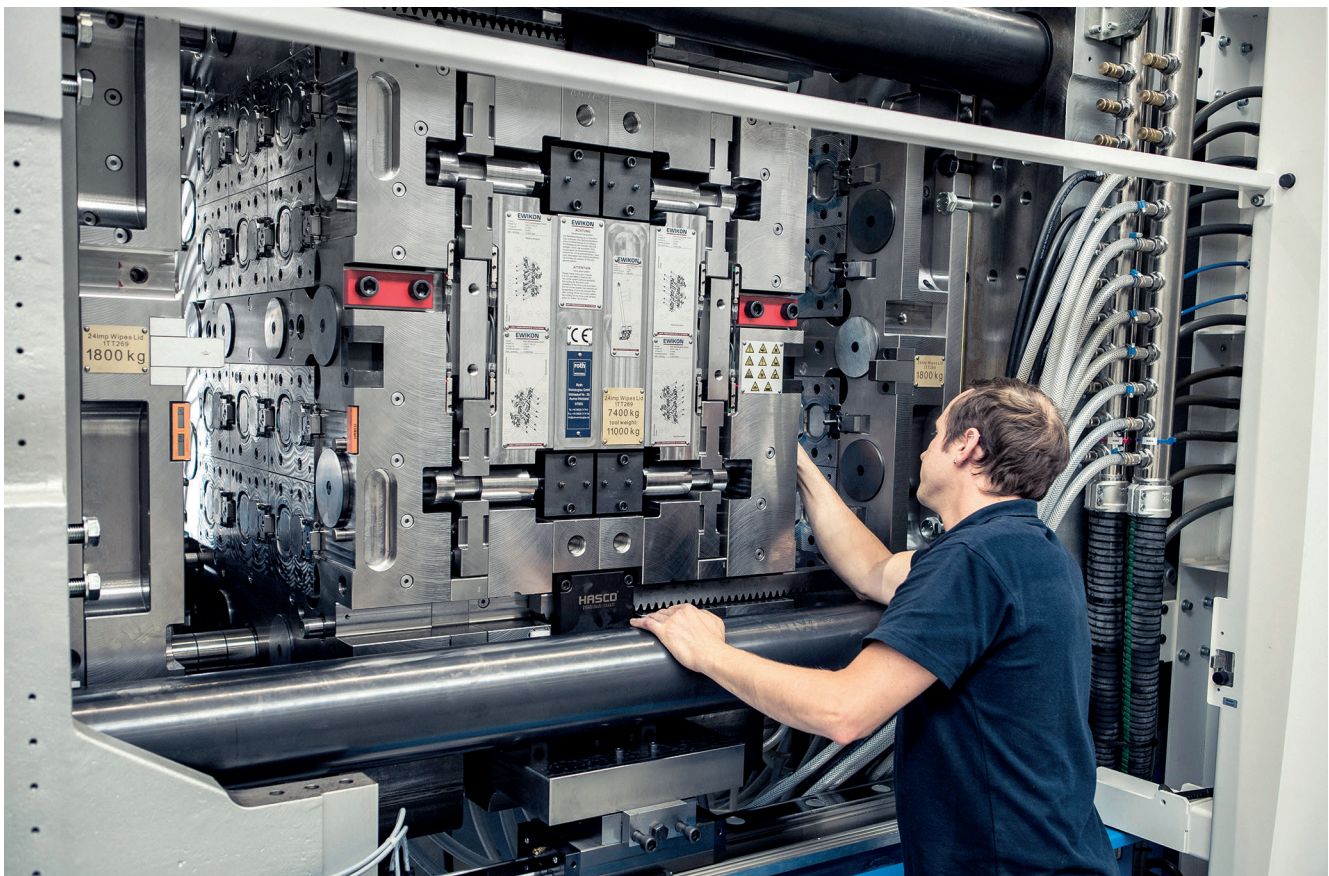


Award-Winning Packaging Solution Increases Productivity

Fully Automated Production Line with Stack Mold and In-Mold Labeling

A solution, which is unique in Europe, significantly increases productivity and comprises the production from a 12+12 stack mold with fully automated in-mold labeling and removal with visual 100% inspection of the parts. The process significantly increases productivity compared to conventional tooling solutions. The Thuringian mold making specialist roth was responsible for the design and construction of the stack mold. Ewikon supplied the customized valve gate hot runner system.



Before relocation to the production site, extensive functional tests and the final trial were carried out at the roth technical center © roth Werkzeugbau

Packaging manufacturer Amaray won the UK Packaging Award 2019 in the "Investment Project" category with a fully automated production line for manufacturing a hinged lid for a wet wipe dispenser softbox (Fig. 1). The center of the 100m² plant is an injection molding ma-

chine with a clamping force of 5800kN (type: El-Exis, manufacturer: Sumitomo (SHI) Demag Plastics Machinery GmbH, Schwaig, Germany) and a sophisticated stack mold. The one-piece hinged cover made of polypropylene (PP) is injection molded in a single operation and la-

beled using the IML (In-Mold Labeling) process.

A linear handling system per parting line positions the labels precisely and within fractions of a second in the cavity removes the finished parts after the injection process and closes them to »



Fig. 1. The hinged lid is injected and labelled fully automated within one working cycle. The original label may not be shown here in consideration of the OEM © Ewikon

achieve a compact packing size. This must be done quickly while the polypropylene is still moldable. After an optical 100% inspection by a camera system, 38 hinged lids are stacked and banded into packaging units. Nine of these units are packed – also automatically – into bags and then into transport cartons.

Fully Balanced Melt Channel Layout on Several Levels

Since the type and size of the injection molding machine and thus the maximum possible mold dimensions and weights were defined by the customer, roth Werkzeugbau GmbH, Auma-Weidatal, Ger-

many, faced a challenge in developing the mold concept. For maximum productivity, a 12+12-cavity stack mold solution optimally adapted to the limited space available was required (**Fig. 2**). "With a mold installation height of 1250mm, we achieved a very compact mold size", explains Benjamin Noack, project manager at roth, "nevertheless, the development of a special set-up concept was necessary, as the mold is just 4mm smaller than the clear width between the machine tie bars".

Therefore, the mold features a modular design with special plug connections for the electrical connections between the plates to ensure optimum dismantling and ease of maintenance, even on the injection molding machine. There were additional restrictions on the weight. With a total mold weight of 12t, 8t could be allotted to the central block with hot runner system due to limited crane capacities at the production site. This required a weight-optimized design of the entire mold structure, to which the hot runner manufacturer (Ewikon Heisskanalsysteme GmbH, Frankenberg, Germany) also had to contribute.

"It was most important that the mold weight was not reduced at the expense of mold stability", says Noack, "here Ewikon was able to support us with a special manifold design. The element technology used allows a very compact, fully balanced flow channel layout on several levels. This made it possible to integrate recesses for additional stabilizing sup-

ports in the manifold. The very space-saving arrangement of the valve gate drive units also helped to reduce the dimensions and weight of the center block. In the end, this flexibility was the decisive factor for us to choose Ewikon".

Despite the weight reduction, however, additional measures were required to stabilize the mold, which is operated by four rack drives, on the machine. For example, the central block is guided in the reinforced machine bed and additionally supported by an adjustable crosshead.

Valve Pins for the Two Gating Points Are Actuated as a Group

To enable a most convenient one-handed operation when removing the wet wipes from the pack, the hinged lid is opened by a push mechanism. To ensure a reliable opening and closing over the entire life cycle, the thin-walled component with a shot weight of around 7.4g and a wall thickness of 0.8mm must be manufactured with high dimensional accuracy. A good filling is essential for this.

Initial tests to gate the part via only one gating point by using a prototype tool which has been purchased locally by the end customer showed unsatisfactory results in terms of filling behavior. So it was decided to use two gating points. In order to determine the optimum injection point positions, roth and Ewikon carried out MoldFlow filling analyses as well as pressure loss and shear calculations for the hot runner and the part in close cooperation. The results were validated in a 1-cavity pilot mold. The article is gated over a gate diameter of 1.2mm with an injection time of 0.15 s. The first gating point is positioned centrally on the surface of the lid, the second on the frame structure of the removal opening. In order to achieve the highest possible part stability the valve pins are opened sequentially so that the weld line of the melt fronts is moved to the desired area 5 mm behind the film hinge.

In each parting line of the production mold, twelve parts are arranged in four horizontal rows of three parts each. For each row, the valve pins for the first and second gating point are actuated as a group via a corresponding design of the supply channels. This requires 16 pneumatic control circuits which are activated by the pneumatic control system of the injection molding machine.

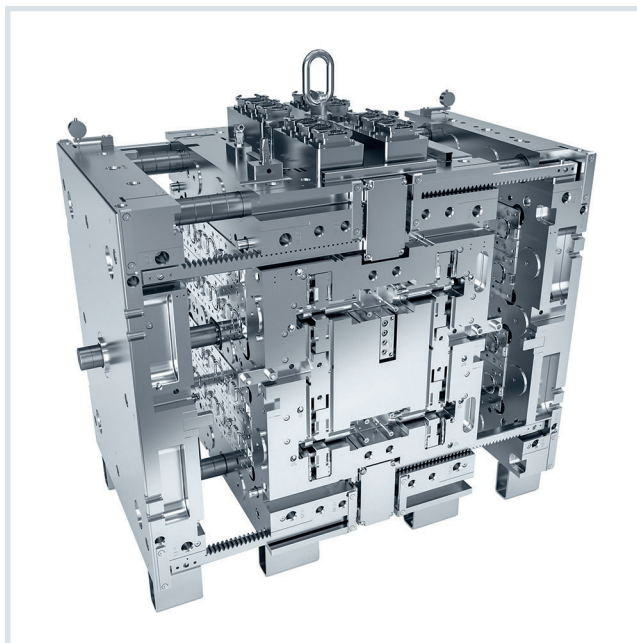


Fig. 2. Modular, compact 12+12-cavity stack mold with valve gate full hot runner system © roth Werkzeugbau

48 Valve Gate Hot Runner Nozzles Vary in Length

Per parting line two manifolds are installed. Each of it has two melt inlets. Each inlet feeds six nozzles or three mold cavities. Thus, one manifold features two completely separated, fully balanced 6-drop flow channel layouts, which are arranged in such a way that the recesses for the supports could be easily integrated. A centrally located bridge manifold with outlets on both sides supplies all manifolds with melt (Fig. 3).

The leakage-free melt transfer from the machine nozzle is achieved by using a valve gate transition snorkel with a cooled pneumatic drive unit screwed onto the bridge manifold. The length of the valve pin is 1000mm, the diameter is 6mm. The 48 installed valve gate hot runner nozzles vary in length by approximately 10mm, depending on the position of the injection point.

The pneumatic drive units are integrated in two middle plates in an extremely compact back-to-back arrangement (Fig. 4). In addition, cooled gate bushes are used. They do not only optimize the cycle time but also improve the gating point quality. In total the mold features 78 control zones and 58 cooling circuits.

Investment Project of the Year

Finally, a cycle time of less than 10s was achieved. Since its start-up in spring 2019, the production line has been producing

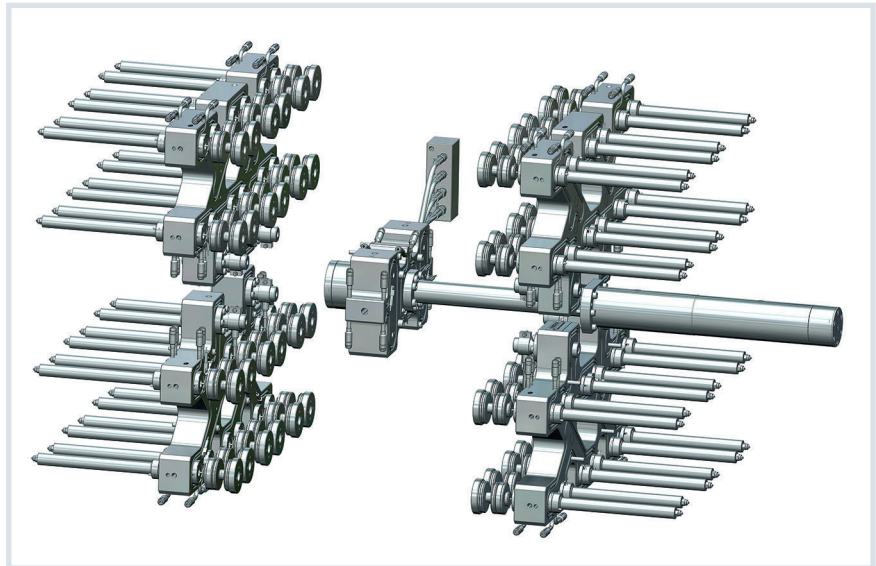


Fig. 3. Hot runner layout of the 12+12-cavity stack mold with valve gate transition snorkel © Ewikon

with a capacity of over 50 million units per year. As comparable in-mold labeling stack molds for the packaging sector have so far only been realized in 8+8-cavity versions at the most, it represents the most demanding and highly sophisticated mold technology solution of its kind in Europe.

The compact design of the mold and the hot runner system, the high productivity and the high degree of automation, which enables the parts to be produced under highly hygienic conditions without any human contact at any point in the production process, were reason enough for the UK Packaging Award jury to award the end customer Amaray the prize for the investment project of the year. ■

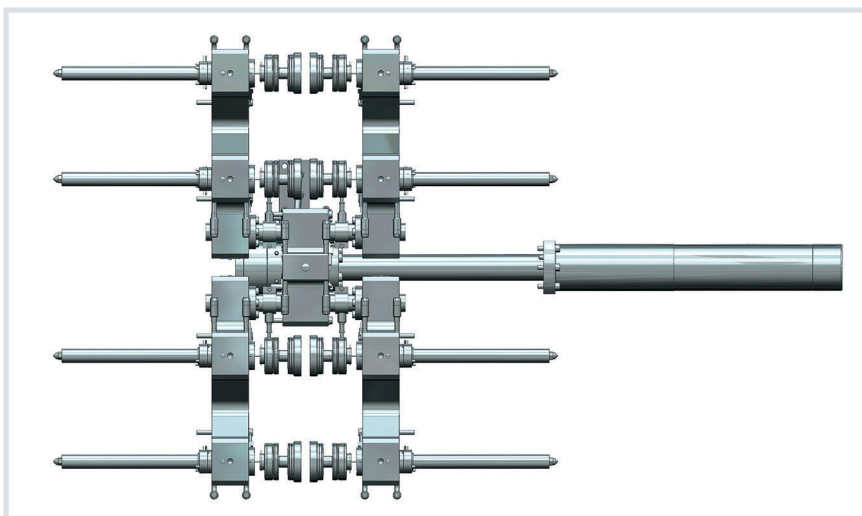


Fig. 4. The compact design with back-to-back arrangement of the drive units contributed to the weight reduction of the mold © Ewikon

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Service

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