The Engel "joinmelt" process allows injection moulding and welding in one step

Moulding and welding within the mould

In collaboration with Hummel-Formen and KVT Bielefeld, Engel sets the path for a new kind of process integration. The joinmelt process supports hot gas welding directly in the mould. Besides cost savings, the new process is also said to improve parts quality and functional safety.

Oil return channels and oil containers are typical examples for hollow composite parts which conventionally were produced in a multi-stage process. First, the two part halves are injection moulded and then welded. But the result usually requires compromises. The commonly used vibration welding can lead to flashes along the welding seam. Ultra-small particles, so-called flitter, may appear and peel away leading to the damage of further functional parts. The hot gas welding would allow a clean and homogenous welding seam, but this process requires absolute plane-parallel joining areas which injection moulded parts do not always offer. Usually there is a certain degree of warpage during the cooling phase and ejection of the part.

The joinmelt process

The joinmelt process combines everything in one: injection moulding is followed by the welding process without the need to take off the two halves of the part as an intermediate step. This solution, for which a patent is pending, promises potential savings, especially in the automotive industry. It removes the need for additional welding equipment. Part take-off and re-insertion are no longer needed, as the finished product can simply be taken off directly out of the mould.

To allow this to happen, both halves of the component are injected simultaneously into a single mould. After the cooling phase, the mould is opened; one half of the part stays in the left half and the other in the right half of the mould. The movable left half of the mould is now positioned so that both parts are opposite each other in the welding position. The heating element is positioned between the cavities and the edges of the component halves are heated. When the mould closes, the two parts are bonded so that the finished part can be taken off when the mould re-opens.

Improving quality and functional safety

Besides the savings potential due to the integration of two manufacturing steps which were previously performed in sequence, the process is said to help to improve the quality and functional safety of the parts. The fact that both product halves remain fixed in the mould during the welding process avoids issues with warping and considerably reduces the time to market. The process creates a clean and thin weld which claims to be strong and to achieve a good quality compared to welds created by legacy techniques with respect to bursting pressure.

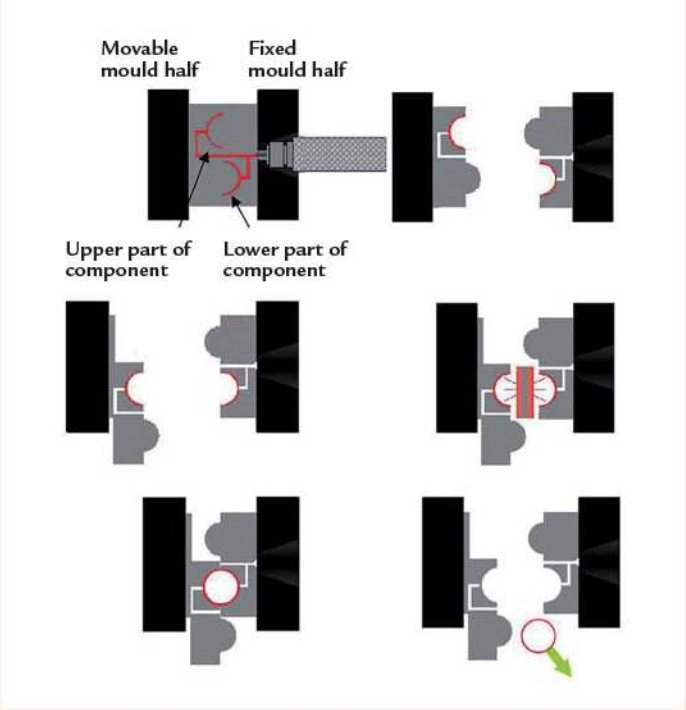
According to the company this technology is suitable for all thermoplastics. The process developers see potential in processing of glass-fibre reinforced polyamides as media-bearing parts for deployment in engine compartments. Thus far these components have always had a visible bulge at the joint, making them prone to friction and reducing the service life of other functional parts, such as the valve tappets.

The joinmelt method shows potential when processing glass-fibre reinforced polyamides for leading components in the engine compartment, such as oil separators. (photo: KVT Bielefeld)

As the joinmelt process avoids the bulge, the process is said to save material and weight. Another benefit becomes apparent as early as the development phase of new products: there is no need to take a specific welding direction into account, and this means freedom of choice with respect to part geometry.

Teamwork with specialists from welding and mould technology

Engel developed this technology in cooperation with two partner companies with the injection moulding machine manufacturer taking responsibility for developing both the machine technology and the software for controlling the integrated process workflow. Hummel-Formen in Lenningen, Germany applied for a patent for hot gas welding in the injection mould and has contributed its mould technology know-how to the collaborative project. KVT Bielefeld, Germany was responsible for the welding



Injection moulding is followed by the welding process without the need to take off the two halves of the part as an intermediate step. (photo: Engel)

technology in the joinmelt project and holds a patent for hot gas welding in a protective atmosphere to ensure a particle-free and highly stable weld.

www.engelglobal.com

Hummel-Formen

The company employs 250 people at two plants and is specialised in injection and compression moulds for plastics with weights of up to 100t. Its service portfolio covers everything from product development through to sample making under volume production conditions.

www.hummel-formen.de

KVT Bielefeld

The company is specialised in the development and production of plastics welding machines for use in various industries from automotive and domestic appliances through to telecommunications and medical technology.

www.kvt-bielefeld.de