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Surprising effects of variotherm temperature control

New approaches and solutions for elastomer injection moulding

In addition to a wide variety of processing and peripheral technology, interesting ideas and clever solutions by mechanical engineers to different problems are to be discovered at house exhibitions. Such items were also to be found among the exhibits of the Maplan Technology Days in Ternitz, Austria, during early June.

Text: Dipl.-Chem. Toralf Gabler, editor of K-PROFI

The material-saving cold runner technology unit for the handling of highly viscous elastomeric mixes, based on natural rubber on their edges, for example. High pressures that burden technology and material, limited flow paths, as well as non-reproducible form filling are some of the common consequences. In a joint project the companies Maplan, SINGLE Temperiertechnik and PETA Formenbau researched how these problems can be met with the known variotherm temperature control in plastics processing. "To do this we have built a pattern tool, in which the cold runner nozzle can be differently regulated with a cold and a hot circuit", explains Franz Kreisel, process engineer at PETA. The temperature of the nozzle is increased shortly before the injection, which reduces the viscosity of the mixture and leads to a better fluidity. Shortly before the end of the injection, the temperature is lowered again.

Reduce cycle time by one-third

"The effects this achieved are enormous," says Peter Simon of Toolax, who is involved in the project as an application engineer for SINGLE. So one can reduce the injection pressure by up to 40%, have shorter injection times and much longer flow paths are possible. "It was surprising for us" says Holger Scholz of the Ingenieurbüro Durotherm that works for SINGLE and Maplan, "that the cure time is also reduced." The reason for this positive effect is still unclear. While the mixture will be injected with a higher temperature, on the other hand less shear energy will be introduced due to the lower viscosity at injection.

"For samples the variotherm temperature control resulted in a reduction in the cycle time from 24 to 16 seconds by reducing the injection and vulcanization time", Rudolf Eisenhuber, head of technology at Maplan summarizes. The processing window is also greater by using this technology. One can see some potential in this technology due to the higher requirements for elastomer products, in particular on the part of the automotive industry, the blends are more complex and thus more difficult to process. "There are already interested parties", says Eisenhuber.

Even pressure distribution and better thermal insulation

Maplan has devised a simple but effective solution to distribute the clamping force evenly over the whole plate. An elastic element of compensation in the form of a rubber plate is used to equalize the pressure. On testing, there have been no significant deviations from the compensation effect even after 20,000 cycles.

To keep the heat loss through the curing phase within limits, the heated tools are provided with special insulating panels. Because these deform over time due to the pressure, numerous items made of titanium for stability are widely used. These are indeed pressure stable, but act as thermal bridges, which negatively affect the insulation. Maplan now presents a new material, which is to replace the titanium elements and thereby ensure both stability and reliable insulation.

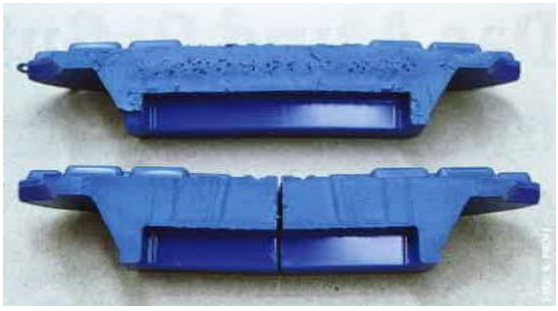
2k-Pieces out of elastomer and elastomer

The Italian toolmaker ORP Stampi, presented an interesting tool concept for the production of 2K- pieces made out of different elastomeric mixtures. The production of such parts is problematic, if the two materials for structural or optical reasons do not flow together, and therefore cannot be injected jointly. The conventional way is to cure a component first and then to spray on the second with a bonding agent, which can have the disadvantage that the union is not reliable enough.

With the technique shown, a thin gasket is made from two mixtures with different shore hardnesses. Both components are simultaneously injected, and then each separated by a valve. After reaching stability of form through vulcanization, the isolating valve is released and the two halves of the tool brought together. Now both components can vulcanise, where a hard bond is created between them both through crosslinking. The challenge here is to find the right time, where both components are stable enough, but when the vulcanisation has not progressed too far.

www.maplan.at, www.single-temp.de, www.duro.de, www.peta-formenbau.de, www.orpstamp.com

Rudolf Eisenhuber (l.), Head of technology at Maplan, explains new ideas and approaches to visitors of the technology days



By using equal vulcanisation times, due to variothem temperature control the lower part of the cold runner nozzle is vulcanised, whereas the upper part at constant controlling is not yet fully cross linked.