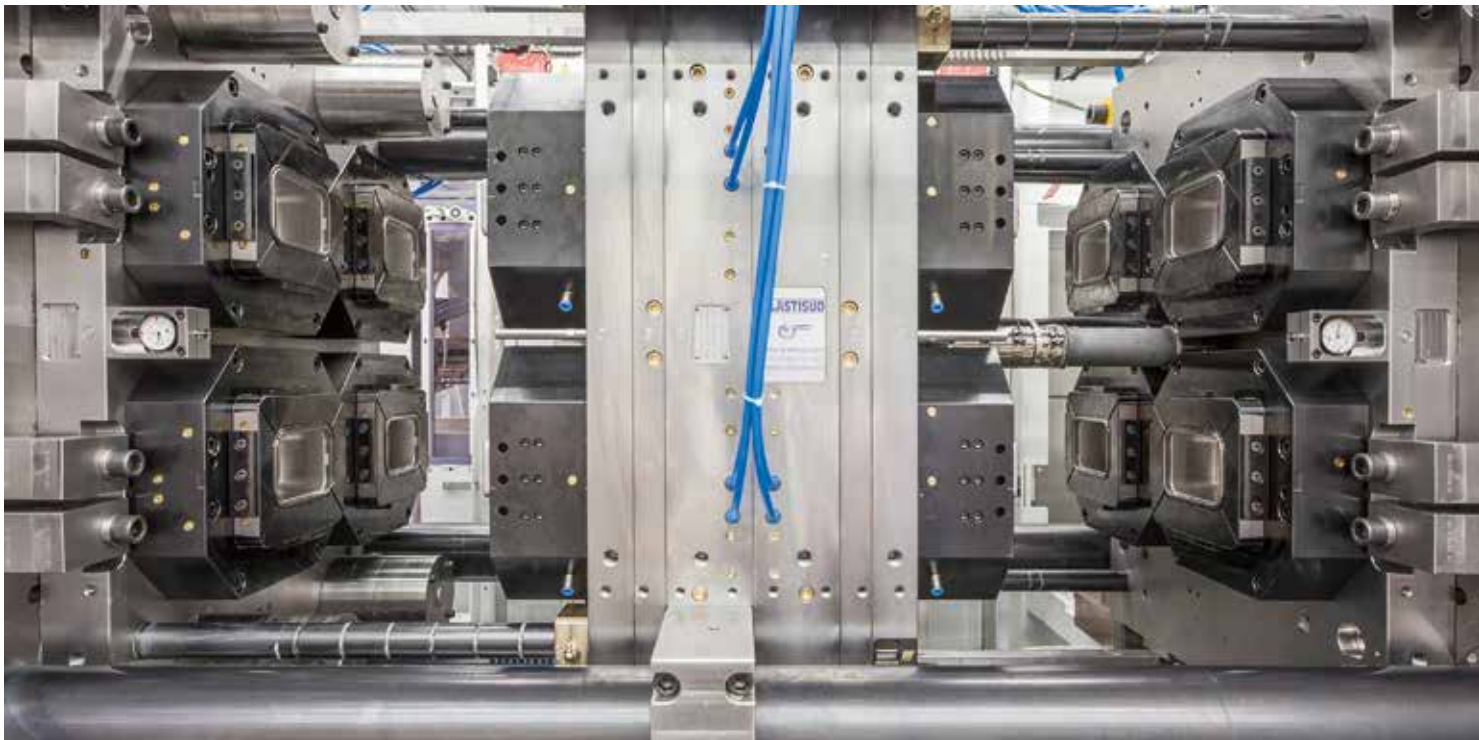


Injection Compression Molding in a Stack Mold

Combination of Technology Is a Novelty in Packaging Production

For a long time it had only been an idea – until the development partnership between Plastisud, Machines Pagès and Netstal put it into practice: injection compression molding of packaging in a 4+4 stack mold. This global innovation will be seen in action for the first time at Fakuma 2015. It combines the advantages of two worlds of plastics processing.



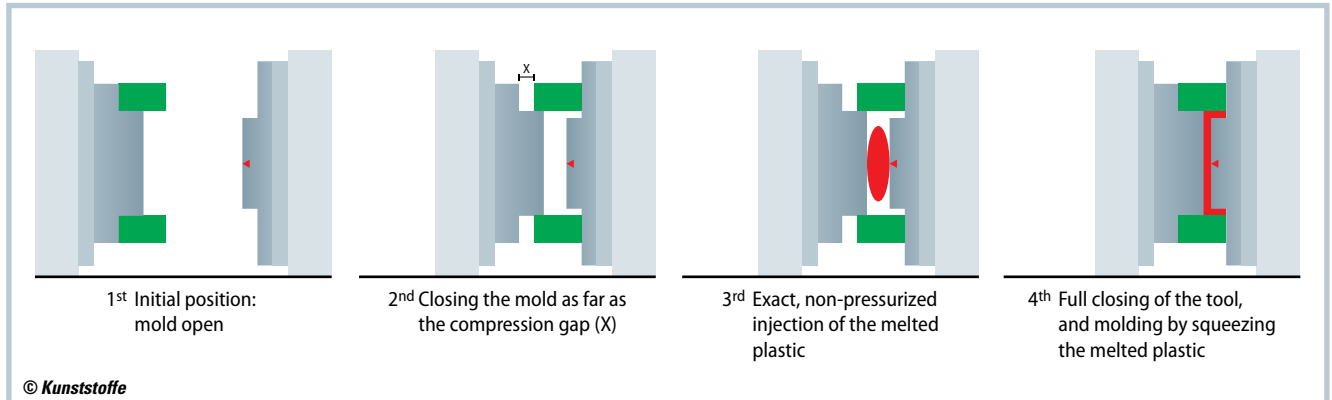
It was a challenge to combine the injection compression molding process with the technology of a 4+4 cavity stack mold but the trio of specialists consisting of Netstal, Plastisud and Machines Pagès managed to meet it within two years (figures: Netstal, Plastisud)

At first glance, it might seem to be almost trivial: With a cycle time of about 5s, a slightly modified injection molding machine from Netstal's Elion Hybrid series forms standard-size 15oz (425g) margarine containers with IML decoration. At second glance, however, it is revealed that the process takes place in a 4+4 stack mold with two parting lines. The truly interesting aspect almost re-

mains hidden: The polypropylene containers are not created in an injection molding process, but rather using injection compression molding. This combination of injection compression molding and a stack mold is an absolute novelty in the industrial production of packaging.

Thanks to the close cooperation between French mold manufacturer Plastisud, automation specialist Machines

Pagès, which is also based in France, and the Swiss injection molding machine manufacturer Netstal, it only took two years to take this project to series production. In 2013, the trio accepted the challenge of combining the injection compression process with stack mold technology. It took Plastisud four and a half months to develop a stack mold that was tailored specifically to the require- »



With this process, economy and efficiency during the production of thin-wall packaging reaches a previously unattained level

ments of the new production process. “The unique, patented technology of injection compression molding guarantees a perfect balance of the two parting lines with a very low dispersion rate,” Plastisud CEO Laurent Buzzo explains.

Specific Process Adjustments

Plastisud had previously carried out attempts involving a pilot mold on a SynErgy series machine. “The special design of the stack mold developed by Plastisud plays a key role in this application,” said Thomas Iten, Manager of Application Technology PAC at Netstal. In order to compensate for the different flow paths of the component, a very sophisticated design is needed and therefore requires a very specific setup of the stack mold.

In order to ensure that the automation was coordinated perfectly with the machine and the mold, Machines Pagès contributed specific know-how that it had acquired in many projects involving handling systems in the In-Mold-Label-

ing (IML) process. Since the plastic melt behaves differently in the cavity during injection compression molding than during injection molding, the labels also had to be adapted to the changed requirements.

Following a multi-week trial and optimization phase with all of the system’s modules, the product of the three company cooperation was ready for operation: An injection molding machine Elion 2800-2000 with hybrid drive concept from Netstal combined with the novel 4+4-cavity stack mold from Plastisud and an IML handling system from Machines Pagès that produces a decorated PP margarine container that weighs 10.7g. Even though the filling of the cavities features an extremely high injection dynamic and takes place in only 100 ms, the low pressure made possible by the compression process prevents material stress from occurring. At Fakuma 2015, interested parties will be able to convince themselves that the system meets all qualitative and quantitative specifications.

Project Partners

Machines Pagès

» www.machines-pages.fr

Netstal-Maschinen AG

» www.netstal.com

Plastisud SAS

» www.plastisud.com

The project partners have made additional information available on this microsite:

» www.injection-compression-molding.com

The Author

Patrick Scharf is the Area Sales Manager for the Business Unit PAC at Netstal-Maschinen AG, Näfels, Switzerland.

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In order to be able to use the compression injection molding process in a stack mold, an injection molding machine of the Elion series with a hybrid injection unit was modified mechanically and with regard to its software

"A Real Innovation Leap"

Iten is convinced that "this is a real innovative leap". Because injection compression molding in a specifically designed stack mold combines the advantages of both technologies without having to compromise elsewhere. Even prior to this new innovation, Netstal had gained experience with the injection compression molding of packaging with a wall thickness between 0.3 and 0.45 mm on "regular" molds with a single parting line. Elsewhere, injection compression molding is usually used for manufacturing large-volume products such as optical lenses or, in the past, the production of blank CDs and DVDs."

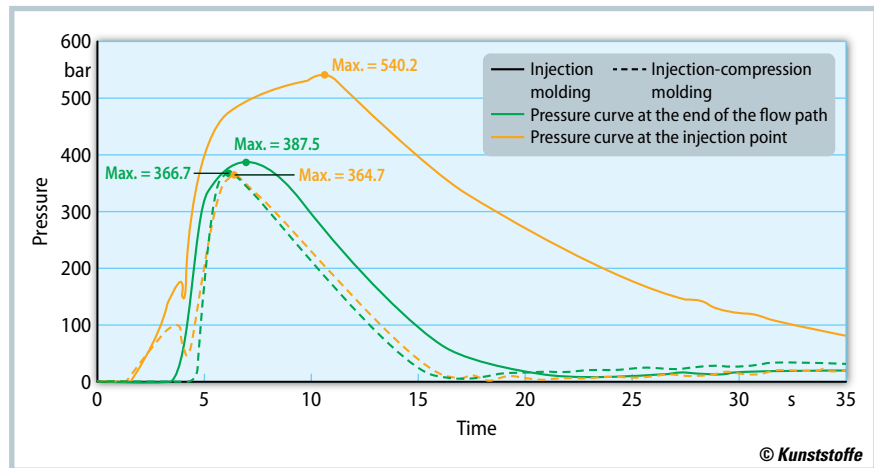
Injection compression molding is a combination of injection molding and compression. The plastic is centrally injected in the still-open mold and then distributed evenly in the cavity by compressing the clamping unit. That means that a compression process replaces the hold pressure common in injection molding. Depending on the molded part, this process either starts during the injection process (meaning in parallel with the injection process) or after injection.

In addition to the qualitative advantages, injection compression molding also provides packaging manufacturers with significant economic benefits. The advanced injection compression molding process ensures them in multiple ways: firstly because of a significant increase in productivity due to the use of a stack mold, and secondly as a result of a remarkable reduction of the wall thickness and therefore of the product weight, which can reach 20% depending on the initial position. This lowers unit costs considerably.

In addition, the clamping force that is needed is reduced by up to 40% compared to conventional injection molding. This allows the use of smaller machines that consequently have lower specific energy consumption, take up less space in the production facility and, last but not least, cost less. These effects are amplified by the impressively short cycle times.

Precise Synchronization of Injection Process and Compression Stroke

However, this interplay makes high demands on the precision of the mold as



Comparison of the pressure distribution within the cavities when using the regular injection molding process and the compression injection molding process



The margarine packaging labeled with the IML process weighs 10.7 g and will be produced live at Fakuma

well as that of the injection molding machine. In order to consistently achieve a high product quality, all process parameters must be kept within narrowest tolerance ranges. "The process requires an extremely high repeatability with regard to the shot weight," Iten emphasizes. And: "The injection process and compression stroke must be synchronized extremely precisely." With an injection time of 0.1 s for the demonstration process, that is a real challenge.

"The use of the combined process is especially interesting for applications with a high output volume, the so-called continuous runners," Iten says. The target group for this global innovation primarily comprises packaging manufacturers in Europe and America. That re-

sulted in the opportunity to attract the Western European production site of a major, internationally active packaging company as a development partner and test user.

Conclusion

The trio of Plasticsud, Netstal and Machines Pagès has provided another example how development partnerships can advance innovations, which are increasingly the result of combining existing technologies. In the meantime, Plasticsud has filed a patent for the combination of injection compression molding with stack molds, which guarantees two perfectly balanced parting lines with a very low dispersion rate. ■