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The Global Magazine of Plastics Processing

Primary Processing

May 1st, 2003

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Process For Thinwall Containers Cuts Part Weight, Cycle Times Process For Thinwall Containers Cuts Part Weight, Cycle Times

By Peter Mapleston

Producers of thinwall containers could drastically reduce their materials consumption, part weight, and production costs - millions of dollars annually, in some cases - through a novel injection molding process that debuts at NPE in Chicago next month. That is the claim made by Coralfoam, in Petworth, England, for its Im-Pak process. It was originally called IIC (Injection-Impact-Compression) and has been used to make ultrathin automobile loudspeaker cones.

Peter Clarke, who heads Coralfoam, recently formed Im-Pak Technologies to license the process, and injection machine maker Netstal Machinery, Naefels, Switzerland, will demonstrate Im-Pak on a 1000-kN (112-ton) Synergy machine at NPE, June 23-27. It will make 0.2-L polypropylene cups, using a purpose-built single-cavity mold from StackTeck, Brampton, on, Canada. The cup weighs under 3 g, over 0.25 g lower than a typical cup. The partnerships are non-exclusive.

Clarke says the next challenge is to develop multicavity single-face molds and stack molds. Further projects remain confidential. Next up will be molds for lids. The Im-Pak process works on round, square, and even rectangular part designs.

In the process, melt is injected as the mold is closing, forming a "biscuit" at the bottom of the cavity. As the mold halves come together, the melt biscuit is squeezed against the sides of the mold with working pressures of 1800 bar, compared with 2400 bar in normal injection molding. The gap between the end of the core and the cavity when the melt begins to be injected - the so-called pre-gap - is anywhere from 10 to 100 times greater than the final gap.

That is one of the key differences between Im-Pak and injection-compression molding. One key reason why this is possible is because, unlike injection-compression, melt injection occurs while the moving platen is moving. Any delay between injection and compression will give the melt too much time to cool and solidify.

The process works best on toggle machines, where movement is changing from high-speed/low-force to low-speed/high-force at the moment of injection. Says Clark: "Reverse profiling," or making the container walls thicker (or at least, less thin) where needed (the same areas where thermoformed parts happen to be thin), and vice-versa, "will be one of the most significant selling points of Im-Pak. Thermoformed parts are always thicker at the bottom, where it's not necessary."

The technology also has advantages over conventional injection molding in several key aspects. Molding cycles are always much shorter since there is no separate injection time and no packing pressure time. Melt density is lower than when the plastic is solid, so as it cools, it shrinks (by around 20% for pp). "In conventional injection molding, you need to pack the extra in afterwards," Clarke's colleague Dave Rickman says. "We put it all in at the same time."

If the part is thin, cooling time is shorter. Alternatively, material can be processed at a lower temperature. High-melt-flow materials are not needed. Lower-priced extrusion grades can be used.

At Coralfoam's facility, Clarke has been doing trials with a 5-lb high-density polyethylene pail on a 1500-kN toggle machine from BMB, Brescia, Italy, with a single-cavity mold. Such pails, for dairy spreads and delicatessen products, typically weigh 76 g, and their molding cycle time is around 8.5 s. Pails made with Im-Pak weighed 54 g (photo). And on a 2400-kN Synergy machine at Netstal's technical center in Stone, England, Clarke produced 46-g pails in under 4 s.

"We can run a 0.5-s cooling time without problem," says Clarke. "To squeeze the last bit of material out of the biscuit, the required clamp force rises steeply. To get the base below a certain thickness is uneconomical. But you can make a pail as heavy as the original on a 500-kN machine."

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