EASTMAN

EASTAR™
copolyester 6763

Thermoforming tips
for extruding sheet

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Introduction

Sheet extruded from Eastar™ copolyester 6763 is easy to thermoform if proper mold design, equipment, and operating techniques are employed. This brochure lists some helpful "tips" in processing Eastar 6763.

Mold design

- To attain more consistent flange thicknesses, easier mold removal, reduced bridging (webbing), and reduced tray fracture issues, Eastman recommends using female molds with generous draft angles (minimum radius of 1.778 mm [5/64 in.]). Eastar™ copolyester 6763 can be used successfully with male molds, but female molds enable more consistent flange thicknesses.
- To achieve proper forming, vacuum channels should lead directly from the inlets to the vacuum holes on the corners of the mold. Additionally, vacuum channels should always be clean.
- To achieve proper forming, minimize the use of right angles in the vacuum system and piping so vacuum speed is maximized and plastic contact with the mold is optimized.
- To prevent excess bridging (webbing) and flange thinning, use proper cavity spacing, especially on male tools. For every 25 mm (1 in.) of depth into the mold cavity, there should be 25 mm (1 in.) of space between cavities.

Note: Mold shrinkage will vary depending on the thermoforming process equipment configuration but is typically 0.4% to 0.5%.

Thermoforming process

- Eastman recommends starting with quality sheet of Eastar™ copolyester 6763. Quality sheet is characterized as having consistent gauge, low contamination, low cosmetic defects, and consistent inherent viscosity or molecular weight.
- Denesting must be augmented for easy blister removal from a stack prior to product insertion on some tray designs.
  - Silicone-coated sheet is often used to optimize denesting of blisters. Eastman suggests using Dow Corning™ 365 silicone.
  - When silicone coating is not permitted, an internal denest can be blended with Eastar™ copolyester 6763. Eastar 6763 C0030 denest is a concentrate recommended and offered by Eastman. It is typically blended with Eastar 6763 at a ratio of 50:1 to 100:1.
- The mold surface should maintain a consistent temperature of 40°C (100°F) to 60°C (140°F) to prevent chill line formation or sticking.
- Heat settings on thermoforming equipment should be adjusted to produce the highest possible sheet temperature without sticking or bridging. For Eastar™ copolyester 6763, the optimum sheet temperature range for thermoforming is 140°C (280°F) to 150°C (300°F). Higher sheet temperatures can result in final thermoformed packages with lower internal stress. In addition, overheating film and sheet will cause the sheet to sag resulting in bridging (webbing) in the final thermoformed package. The degree of sheet sag is directly proportional to the combined effects of oven temperature and the sheet dwell time in the oven. Decreasing oven dwell time while increasing oven temperature allows higher sheet temperatures without excess sagging. Decreasing the oven dwell time has the added benefit of decreasing cycle times. This also enables the use of smaller ovens on the thermoforming machine, decreasing energy needs and the process footprint.

- For blank-fed male mold thermoforming machines, forming can be improved and bridging can be decreased or eliminated by using wire-helper grids.
- Internal stresses should be monitored using a polarized light table.

Cutting sheet

Sharp, properly guarded and well-maintained steel cutters are required for proper cutting of formed parts. The cutters can be of the rule, roller-die, matched-die, slitter, or guillotine design.

- Proper clearance between punch and die (usually zero) should be maintained with matched-die cutters.
- Double-bevel die stock measuring 3-point, 1.1 mm (0.042 in.), with a Rockwell C hardness of 50 to 55 is suggested when cutting simple-shaped blisters.
- Complex-shaped blisters should be cut with double-bevel die stock measuring 3-point, 1.1 mm (0.042 in.), with a Rockwell C hardness of 45 to 50.
- Blisters of Eastar™ copolyester 6763 should be cut through completely when using steel-rule cutting. The cutting stroke on the trim press should stop just after cutting through the blister. This is known as a "kiss" cut.
- Stainless steel striker plates 3.2-mm (0.125-in.) thick with an equivalent or slightly softer hardness than the die material is recommended.
- Heated steel-rule knives can often improve the quality of the cut.
- Dies should have steel backup plates with a thickness of 0.80 mm (0.030 in.).
- Backup plates should be made of metal with a Rockwell C hardness of 30 to 35.

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