TOPAS®
Cyclic Olefin Copolymer (COC)

BLISTER FORMING

TOPAS® COC-based Blister Film for Pharmaceuticals and Personal Care

TOPAS
Advanced Polymers

1. Introduction

This guide provides technical information to thermoformers of COC-containing film for the packaging of pharmaceuticals and personal care products. The basic information included in this guide will assist in successful forming.

TOPAS® cyclic olefin copolymers (COC) feature high transparency, low density, high stiffness, good thermoforming properties and excellent moisture barrier capabilities. They are halogen-free polyolefin resins consisting entirely of carbon and hydrogen. Because TOPAS resins are amorphous, they deliver much better thermoforming performance than other polyolefins.

TOPAS films are often lined on both sides with polypropylene (PP) to improve impact resistance, but TOPAS film structures with PETg or HDPE outer layers and laminates with PVC or PVdC are also commercially available. By varying the film structure, particularly the TOPAS layer thickness, the barrier effect can be tailored to application requirements.

2. Thermoforming

The thermoforming process consists of heating a thermoplastic film to its softening temperature, then forcing the film against a cool forming mold by vacuum or pressure. The film is held against the mold surface and allowed to cool so that the plastic will retain the mold shape and detail.

TOPAS-containing films can be thermoformed on equipment designed for PVC. Additional equipment such as plug assist is not necessary, but can be used if available. Heating plates, mold and plug assist should usually be coated with an anti-stick layer.

Many variables will affect the final part appearance and performance; forming a new part design may require some degree of trial and error. General guidelines are discussed in this section.

The forming temperature of the sheet is one of the most critical processing parameters, and can be dependent on the cycle time. The core film temperature should reach 90 to 100°C, which corresponds to a pre-heating temperature of 110 to 130°C. Experience on several machines suggests that TOPAS-based films often form best at a slightly *lower* (5 to 10°C) temperature than PVC films of the same thickness. It can be advantageous to reach higher temperatures with longer cycle times, rather than by increasing the plate temperatures to a level that causes sticking. Cooling temperature of the mold should be 10 to 20°C. Higher cooling temperatures can be used for deep forming or complex shapes.

For thin-gauge thermoforming, the time to form and cool the sheet against the mold surface should generally equal the time to heat the sheet to the forming temperature.

Please consider that excessive forming temperatures can lead to a number of part defects, including film splits and excessive thinning of the sheet. Forming temperatures that are too low can result in film splits, poor definition of part details, and whitening of the film from stretching beyond its yield point.

3. Troubleshooting

Problem	Causes	Potential Solutions
Insufficient Blister Forming	Sheet temperature too low	Increase pre-heating temperature in 5°C steps if stress whitening
	Sheet temperature too high	Decrease pre-heating temperature in 5°C steps if walls too thin
	Pressure too low	Check air pressure (5 to 6 bar/ 70-90 psi recommended)
	Forming too quickly	Increase forming time in steps
	Blister spacing insufficient	Use tooling with wider spacing
	Different film grade	Best processing condition depends on film structure and polymer combination (i.e. COC and skin layer, type and thickness); different conditions may be required for best results
Film splits	Sheet not heated uniformly	Ensure heaters are functioning. Minimize air flow through areas that may cool areas of the sheet
	Draw ratio too high for selected film thickness	Select alternative forming process technique, such as evacuation or plug-assist. Use thicker film if available
	Excessive forming speed	Slow tool
Film wrinkling or creases	Heat too high or not uniform	Check and correct
Creases in blister	Insufficient air evacuation	Check and correct
Release problems	Anti-stick coating	Check if coating is damaged or deposits are visible

4. Appendix

Examples of TOPAS forming conditions
Conditions were optimized on lab line to get best blister forming results. No plug assist was used.

Film [µm]	Pre-Heating [°C]	Sealing [°C]	Cycles [1/min]	Forming Line
PP/TOPAS/PP (30/190/30)	120-130	175	25	Medipak CP-2
PP/TOPAS/PP (30/240/30)	120-130	175	25	Medipak CP-2
PP/TOPAS/PP (30/300/30)	125-135	175	25	Medipak CP-2
PVC/TOPAS/PVC (30/190/30)	120-130	175	25	Medipak CP-2
PVC/TOPAS/PVC (30/240/30)	120-130	175	25	Medipak CP-2
PVC/TOPAS/PVC (30/300/30)	140	175	25	Medipak CP-2
PVDC/TOPAS/PVC (90g/240/30)	130	175	25	Medipak CP-2
PE-HD/TOPAS/ PE-HD (40/300/40)	145	180	25	Uhlmann UPS 200
PE-HD/TOPAS/PP (40/300/40)	145	180	25	Uhlmann UPS 200

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