Polytrope® STR Enhanced Polyolefins

Thermoforming Guide

Drying

Normally, drying of sheet produced with *Polytrope® STR* resins is not necessary. However, drying sheet immediately prior to forming may lead to improved surface finish. Sheet that is pre-dried for 2 – 4 hrs at 140 –180 F (60 – 82 C) is typically sufficient.

Protective and Forming Mask

A protective or forming mask may be applied to the appearance surface of the sheet as supplied. Consult with your sheet provider to determine if the mask must be removed prior to forming or if it is formable.

Tooling

The preferred tooling is temperature controlled, machined or cast aluminum. Epoxy or polyester tooling may also be used for shorter runs. Ceramic and epoxy metal composites have been found to be suitable for some applications, but have limited use to date. Vacuum holes of 0.040 inch (1.016mm) maximum diameter (#60 drill bit) are suggested; smaller are preferred. Formed sheet thickness and location will dictate the actual size. As a general rule of thumb, the vacuum hole under a smooth "A" surface should not be greater than a factor of 5 less than the final wall thickness of the formed part. Sandblasting the surface of the tooling to prevent air entrapment and sticking is recommended. Mounting of the tool on the top platen is preferred for positive forming. Mounting of the tool on the bottom platen is preferred for negative forming. Plug assist may be used for negative forming with syntactic foam plugs as the preferred materials of construction. Temperature controlled plugs may also be used.

Shrinkage

Shrinkage of sheet produced with *Polytrope® STR* resins is approximately 0.007-0.009 in/in (0.7-0.9%). Shrinkage rates will vary depending upon part geometry, sheet thickness, and forming conditions. Consult your supplier for specific shrinkage rates data.

Heating

It is important to have control over the heating process to ensure that quality, uniformly heated sheet is delivered to the forming station. The most capable process will consist of both top and bottom heaters. Ceramic or quartz heaters are suggested for the forming of sheet produced with *Polytrope® STR* resins. Cal-rod and gas heaters are not recommended. Multiple, adjustable, zone controlled heating elements provide the best control of sheet temperature. The preferred means of determining when to transfer the sheet out of the oven is through the use of IR position sensors. Transfer by sensing sheet temperature or by time may also be used, but are the least preferred methods.

Temperatures

Although part configuration and other factors will dictate oven settings, as a start point profile the top and bottom oven temperatures are to be hotter at the edges over the clamp frame than in the center. Maintain the top and bottom oven heat profile one foot beyond the edges of the clamp frame to create a heat curtain, which aides in achieving oven temperature uniformity. Apply greater heat to the substrate side of the sheet than applied to the appearance surface side of the sheet. Ensure there are no cross drafts through the oven which may disrupt the heat profile and result in thickness variation in the formed parts. It is recommended to cycle the clamp frames through the oven to allow them to preheat prior to forming the initial sheet. Suggested thermoforming temperatures of sheet produced with *Polytrope® STR* resins are provided below.

PARAMETER	VALUE
Sheet Surface Temperature measure in oven, °F (°C)	340 - 420 (170 - 215)
Sheet Surface Temperature measured at form station, °F (°C)	320 - 400 (160 - 205)
Tool Surface Temperature, °F (°C)	170 - 200 (77 - 93)
Part Demolding Temperature, °F (°C)	140 - 175 (60 - 80)
Minimum Vacuum, inches of Hg (bar)	25 (0.85)

Forming

It is suggested to use vacuum bleed control in the forming process. Bleed in vacuum as the tool hits the sheet and until the sheet is pulled onto the mold surface before initiating full vacuum.

Cooling

If distortion of parts occurs following de-molding, or if faster cycle times are desired, cooling fixtures may be used to provide additional cooling and help control final part dimensions.

Trimming

Sheet produced with *Polytrope® STR* resins can be trimmed by using methods which are acceptable for most other materials. Typically, a router method is used for heavy gauge parts produced with *Polytrope® STR* resins.

Trouble Shooting

A comprehensive trouble shooting guide as well as additional applications and design information can be referenced and downloaded at **www.aschulman.com/polytropestr.**