

Pre-Stretching Methods

MATERIAL USE GUIDELINES

Pre-stretching for Improved Wall Thickness Uniformity

When heated sheet contacts a mold, it can cool and resist “flowing” uniformly as it is formed. Pre-stretching heated sheet before it contacts the mold surface allows more control of thickness uniformity. Two methods are commonly used, depending on mold design:

1. Snap-back Vacuum Forming

In this process, vacuum or compressed air forces the heated sheet into the pre-stretch box, causing it to “sag” or form a bowl shape. Typically, the sheet is stretched to about 2/3 of the designed depth of the part. An electric eye can help regulate the level of stretch. As a pre-stretching technique, this method uses the least expensive tooling: a male mold and a simple pre-stretch box, compared to a costlier plug assist with a negative mold (see *plug-assist* below).

Once the sheet reaches the desired stretch or “sag,” the vacuum or air pressure is shut off. A secondary vacuum between the mold and the sheet then causes the sheet to “snap back” onto the mold surface.

Advantages

- Least costly tooling for pre-stretching sheet
- Allows for very deep draws
- Uniform wall thickness control, minimizes thinning

2. Plug-assist Forming

A plug-assist allows pre-stretching sheet when using female molds. The plug, similar in configuration to the mold cavity but typically 10-30% smaller, pushes the heated sheet into the mold. As it contacts the sheet, air pressure applied between the sheet and the mold surface causes the sheet to billow around the plug, keeping it from contacting the mold surface and setting up prematurely. When the plug-assisted sheet is pushed near the bottom of the mold, a rapidly applied vacuum draws the sheet tightly to the mold surface.

Advantages

- Greater depth of draw with female molds
- More control of wall and bottom thickness
- Minimizes sheet thinning

Note: Using heated plugs made of insulating materials (wood, syntactic foam, thermoset) helps avoid cooling the sheet during contact. Aluminum plugs with temperature controlled electric heaters also work well, but are usually more costly.



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