

Vacuum Forming

Definition

It is one of the type of the **Thermoforming Process** in which vacuum is used to get the desired shape.

Process

The process involves heating a plastic sheet until soft and then draping it over a mould. A vacuum is applied sucking the sheet into the mould. The sheet is then ejected from the mould.

Process

Clamping

The clamp frame ensures the plastic sheet is held firmly in place during the forming process.

Heating

Radiant heaters are normally used to heat the sheet which has been positioned over the aperture of the vacuum forming machine. For thicker sheet both surfaces may need to be heated and more sophisticated machines allow this. Heaters move into position both above and below the sheet.

Process

Pre-stretch

Is used to achieve "even" wall thickness. Air is introduced to blow a small "bubble" and the mould is then raised into the pre-stretched sheet.

Vacuum

A vacuum is applied, the sheet is drawn into intimate contact with the mould and the mould detail is picked up.

Process

Cooling and Release

The material is allowed to cool. The cooling process may be shortened with blown air or even a fine water spray. The molding may then be released from the mould by introducing a small air pressure.

Finishing

After molding, any mould finishing may be performed, trimming, cutting, drilling, polishing, decorating etc.

Thermoforming & Vacuum Forming



Please select picture to have a larger view and detail.



Blister Packs



Blister Packs



Blister Packs



Blister Packs



Blister Packs



Slide-on Blister Packs



Slide-on Blister Packs



Slide-on Blister Packs



Slide-on Blister Packs



Slide-on Blister Packs



Clamshells



Clamshells



Clamshells



Clamshells



Clamshells



Tri-Folds Clamshells



Tri-Folds Clamshells



Tri-Folds Clamshells



Tri-Folds Clamshells



Tri-Folds Clamshells

Part Design

This is probably the most important consideration in getting a good part that will perform the function you want it to.

Size - is definitely a consideration. If a part is too large for your equipment, that is a problem.

Shape - There are certain shapes that do not lend themselves to vacuum forming because the draw ratio in certain spots and sometimes the entire part become too great. Varying the wall thickness as in injection molding is impractical too.

Draft

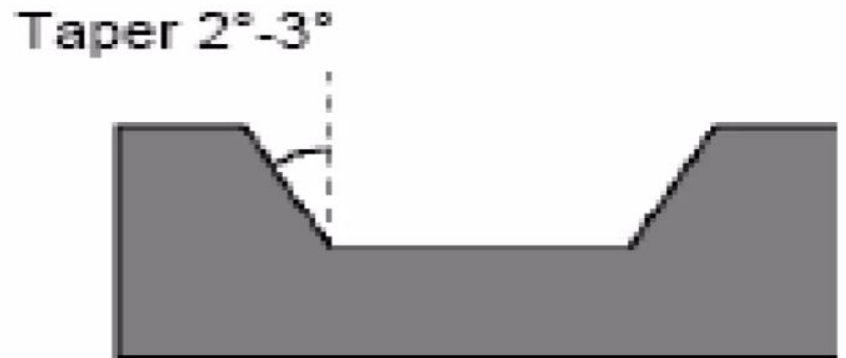
Draft - Draft is a primary consideration on part design and it depends upon whether the mold is a male or female mold.

5 degrees – male tool

3 degrees – female tool



Male Mould



Female Mould

Undercuts- Should be avoided as far as possible. If required should be given for small dept and at proper location of the mold. It makes the mold design very complicated.

Radii- Generally speaking, the amount of radius is related to the size of the part. It also depends the type of the mold And thickness of the sheet.

Texture- Generally textured sheet is used. Regular pattern is generally avoided as it gets distorted after forming. Fine graining is generally used. Increase in grain height will affect the change in thickness.

Part Integrity & Functions- Attention has to be given while designing the part so that it can have strength in built. Mounting points has to be decided so that load will be distributed equally.



Cups
Wheel Guard
Plastic Trays

Limitations

Vacuum forming offers several **processing advantages** over other forming processes. **Low forming pressures** are used thus enabling comparatively **low cost tooling**.

Since the process uses low pressures, the moulds can be made of inexpensive materials and mould fabrication time can be reasonably short. Prototype and low quantity requirements of large parts, as well as medium size runs therefore become economical.

More sophisticated machines and moulds are used for continuous automated production of **high volume items** like yoghurt pots, disposable cups and sandwich packs.

Unlike other thermoplastic forming processes, where powder or resin are the starting point, vacuum forming **uses extruded plastic sheet**. With vacuum forming a secondary process may be required to trim the formed sheet to arrive at the finished part. The trimmed waste can then be **re-ground and recycled**

Limitations

Advantages – Low tooling cost

Less lead-time

**Clean process as sheets are directly used
different thermoplastic materials can be used**

Good for prototyping

Pre-colored sheets can be used.

Limitations – Design flexibility

Thickness of the sheet

Thickness variation within a part is not possible

Difficult to control the A surface

Small radii are problems

Difficult to maintain the grain structure

Only thermoplastic materials can be used

Dashboard



Door Trim

