

Thermoforming Processes

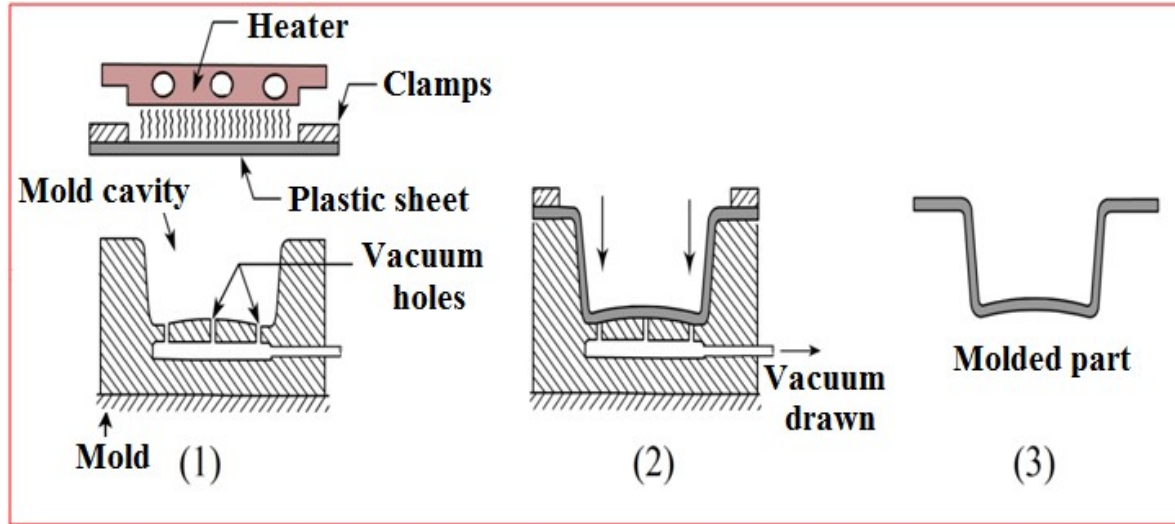
Thermoforming

Thermoforming is a plastic processing technique in which the thermoplastic sheets are formed with the application of **heat** and **pressure** in a mold.

Different types of thermoforming process are:

- Vacuum forming
- Pressure forming
- Matched die forming

Vacuum Forming Process

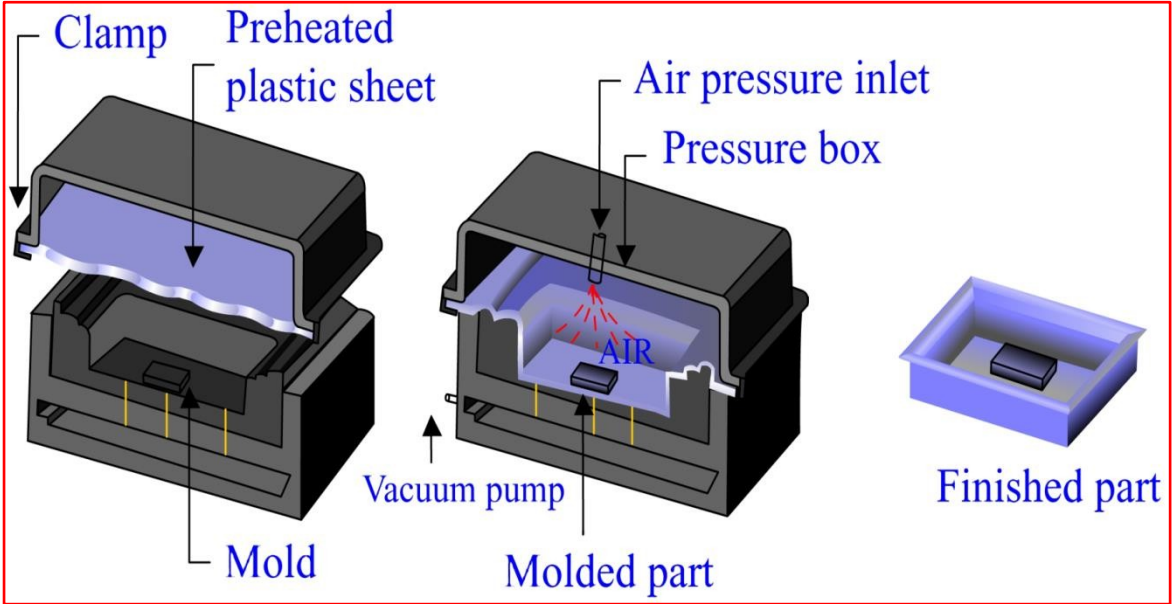


Vacuum Forming

- The vacuum pressure is used to form the heated thermoplastic sheet into the desired shape.
- Thermoplastic sheet is placed on the mold surface and fixed with the help of clamping unit.
- The sheet is heated until it softens and thereafter vacuum needs to be applied quickly.

- A surge tank is used to quickly pull the air out between the mold cavity and the sheet.
- When the vacuum is created, the sheet conforms to the shape of the mold cavity.
- The formed part is cooled and then ejected from the mold cavity.

Pressure Forming

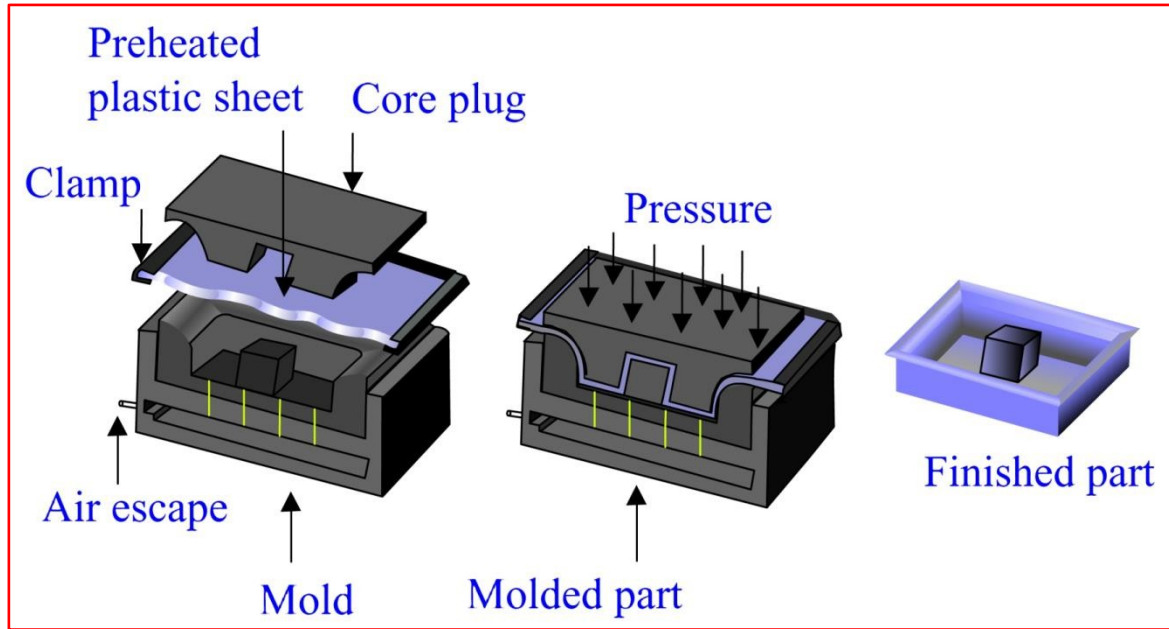


Pressure Forming

- The pressure forming process is closely related to vacuum forming.
- The air pressure required is much higher as compared to the vacuum forming.
- The preheated plastic sheet is placed on the mold surface, and then air pressure is applied quickly above the sheet.

- The high pressure is developed in between the softened sheet and the pressure box.
- Due to high pressure, the preheated plastic sheet can be deformed into the mold cavity in a fraction of a second.
- The formed sheet is held in the mold cavity for cooling for a few seconds.
- The formed part thereby solidifies and is ejected from mold cavity.

Match Die Forming



Matched Die Forming

- Matched die forming is also called mechanical forming.
- Mold consists of two parts i.e. die and punch.
- Thermoplastic sheet is heated with the application of heat until it softens.

- Preheated sheet is placed into the die and through punch pressure is applied on the sheet.
- Air in between the die and sheet is evacuated by using vacuum pump, and sheet conforms to the mold shape.
- Formed part is cooled and ejected from the mold.

Materials Used

Different types of thermoplastics which can be processed using thermoforming process are:

- Low density polyethylene (LDPE)
- High density polyethylene (HDPE)
- Polypropylene (PP)
- Polystyrene (PS)
- Polyvinyl chloride (PVC)
- Acrylic (PMMA)
- Acrylonitrile butadiene styrene (ABS).

Advantages

- Design flexibility
- Rapid prototype development
- Low initial setup costs
- Low production costs
- Less thermal stresses
- Good dimensional stability

Disadvantages

- Poor surface finish
- Parts may have non-uniform wall thickness
- All parts need to be trimmed
- Ribs and bosses cannot be molded easily
- Limited materials can be used
- Very thick plastic sheets can not be formed

Applications

Thermoforming process has many applications:

- Food packaging
- Automotive parts
- Trays
- Building products
- Aircraft windscreens.

Food Packaging



Automotive Interiors

