



Introduction to Thermoforming and Vacuum Forming

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Introduction

Many people and even engineers do not understand exactly what Thermoforming is or the differences between thermoforming, vacuum forming and how these processes compare to injection molding or roto-molding. We hope the following guide clearly explains each process and how they differ and where they would be utilized.

Whether your finished product is a medical device, fitness equipment electronic equipment, you'll need custom plastic enclosures that are durable, cost-effective, high quality and aesthetically appealing.

Thermoforming offers close tolerances, tight specifications and sharp detail. For flexibility in tooling and engineering and fast set-up and production of custom plastic enclosures—especially prototypes and large parts in quantities from dozens to thousands—thermoforming is commonly selected over injection molding.

In this white paper report we will illustrate how each process works and the advantages of each. If you have other questions please contact Mayfield Plastics to discuss your particular needs and questions.



Pressure Forming

Pressure forming is a sophisticated version of the vacuum forming process. This process closes the appearance gap with traditional molding techniques. Pressure forming is really an old thermoforming technique which has been used by the thin-gage plastic packaging forming industry for many years.

The mold makers start by creating a pattern based upon drawings and specifications of the custom part. From the pattern, these craftsmen produce either a hardwood or aluminum mold. A wooden mold is used mainly for a customer required prototype or a very low volume production run. The aluminum mold is used for a full production run and when the pressure forming process is necessary.

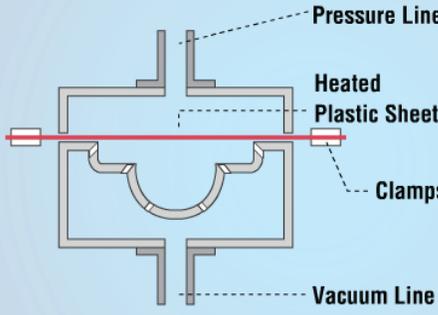
The pressure forming technique provides for forming heavier sheet from 0.093” thick up to 0.375” thick. The technique is accomplished by forcing a hot sheet against a mold, usually female, by introducing compressed air to the back side of the heated sheet. This method will provide as much as 75 psi working on the sheet surface as compared to the 14 psi in vacuum forming.

Pressure forming can achieve the high quality and detailed look of injection molding, without the expensive tooling costs. By using air pressure on the back side of the sheet during the forming process, textures, undercuts and injection molding details can be achieved.



Pressure Forming

PRESSURE FORMED PARTS



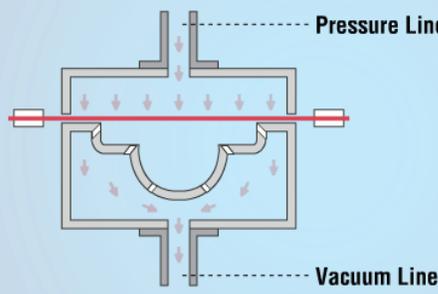
Pressure Line
Heated Plastic Sheet
Clamps
Vacuum Line

An oven heated plastic sheet is introduced to the mold. The seal is made around the entire perimeter, the vacuum is turned on, then the hot sheet conforms to the shape of the mold.

NEXT ▶

Step 1

PRESSURE FORMED PARTS



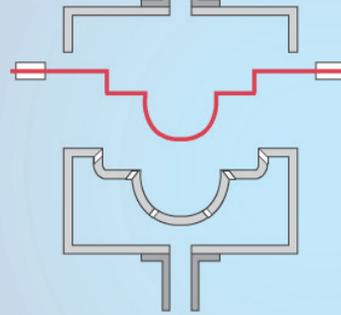
Pressure Line
Vacuum Line

Both the vacuum and the air pressure are turned on. The added air pressure (50-100lbs) from the back side of the sheet causes the hot sheet to completely press against the mold picking up additional detail not normally found during straight vacuum forming.

NEXT ▶

Step 2

PRESSURE FORMED PARTS



Details like sharp corners, logos and mold texture are examples of the features available while pressure forming.

The temperature controlled mold then starts to cool the part. The part is removed from the clamp frame and is ready for secondary trimming operations.

NEXT ▶

Step 3



Vacuum Forming

Mayfield Plastics is a major national and international vacuum forming supplier to major OEM's. We are a custom vacuum forming supplier to major medical manufacturers across the country as well as a variety industrial and electronic firms. However, due to our central location in New England we can be a local vacuum forming supplier to companies in Massachusetts (MA), Connecticut (CT), Rhode Island (RI), New Hampshire (NH), Maine (ME) and Vermont (VT) and all of the USA.

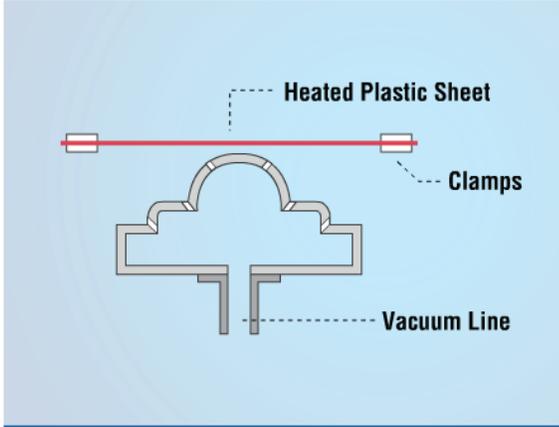
Vacuum forming is an economical process for producing large sized, low volume parts at a reasonable price. Vacuum forming involves the controlled heating of a thermoplastic material to a temperature where its shape may be altered to the shape of the mold. The physical change to the preheated thermoplastic is accomplished by vacuum force.

The advantages of vacuum forming are the capability to form large parts without expensive equipment and tooling, ease of producing large quantities, inexpensive mold and design modifications, and laminated or foam-filled parts capability.

Thermoplastics most commonly specified are acrylic, ABS, PVC, CAB and polycarbonates. Exotic types include Turlan, Espel and Teflon. Precolored sheets are also used in addition to the secondary steps of robotic painting, pad printing, hot stamping and silk screening.

Vacuum Forming

VACUUM FORMED PARTS



An oven heated plastic sheet is introduced to the mold.

Heated Plastic Sheet

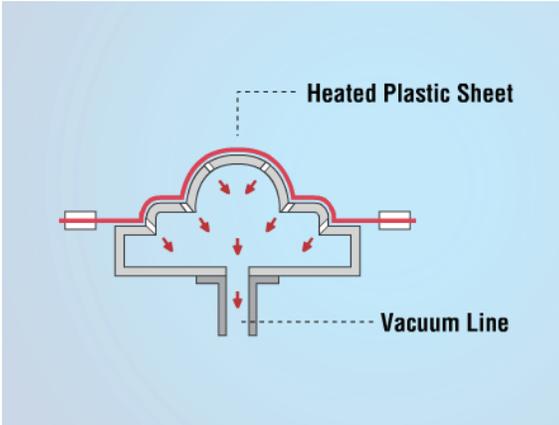
Clamps

Vacuum Line

NEXT ▶

Step 1

VACUUM FORMED PARTS



The seal is made around the entire perimeter, the vacuum is turned on, then the hot sheet conforms to the shape of the mold.

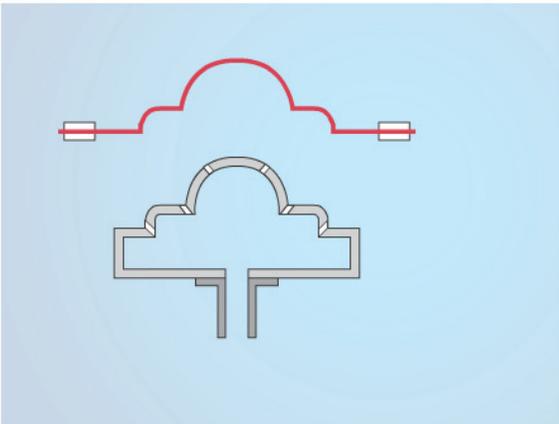
Heated Plastic Sheet

Vacuum Line

NEXT ▶

Step 2

VACUUM FORMED PARTS



The temperature controlled mold then starts to cool the part. The part is removed from the clamp frame and is ready for secondary trimming operations.

NEXT ▶

Step 3

Highly Experienced and Talented Craftsman Differentiate Mayfield Plastics Today

The quality of thermoformed plastics parts depends on the expertise used to produce the molds that produce exceptional plastic parts.

Mayfield Plastics is one of the few thermoforming companies that controls all facets of moldmaking in-house. We employ talented designers, machinists and all the equipment and tooling needed to produce the majority of our molds in-house. This provides the ultimate control over both quality and delivery schedules.



Thermoforming Mold Making

Thermoforming molds can be produced from a wide variety of materials, depending on the size of the part, quantity, detail and accuracy. In some cases, molds may be made from wood or a combination of wood and other materials in a “fabricated” assembly. These types of molds are crafted completely in our facility by experienced mold makers who have been on the job for over 30 years. They possess the prime characteristics of fine craftsmen: talent and experience coupled with immense pride in their work.

Our mold makers use cast aluminum molds for larger quantities production. Aluminum molds are designed by CAD designers. Once designed, these mold designs are transferred to our CNC routers that produce the patterns required for the final mold.

Mayfield Plastics differentiates itself from most thermoforming companies by controlling the mold making process, thereby significantly reducing aluminum mold production lead times.



Plastic Thermoforming or Injection Molding?

In deciding between plastic thermoforming and injection molding for your next project, there are several important factors to keep in mind:

Tooling costs for thermoforming are 85 percent to 90 percent lower than tooling costs for injection molding. Thermoforming, particularly pressure forming, is more cost effective for very large, thin-walled parts, where the tooling costs would be prohibitive with injection molding. Despite pressure forming's lower costs, nothing is sacrificed in terms of quality: Plastic thermoforming can achieve highly cosmetic finishes, providing the look and feel that meet the end user's expectations.

Thermoforming applications often also use painting and secondary assembly in the production of value-added parts. In the end, the best way to decide how to proceed is with the assistance of a trusted, knowledgeable plastics processor.

Mayfield Plastics' engineering support staff can walk you through the design and manufacturing of your part to ensure the best geometries and most efficient processes to meet your bottom line requirements. If your project requires injection molding, we can identify a Mayfield business partner to meet your needs.

Put our plastic expertise to work for you—call at 800-339-3476 to begin the process.



Thermoforming or Rotomolding?

Rotomolding and thermoforming both offer advantages, depending on the type of project at hand.

The key advantages of thermoforming include:

- Sharp detail
- Tight tolerances
- Flexible tooling and engineering
- Efficient set-up

Rotational molding offers:

- The ability to mold multi-piece parts as one unit
- Consistent wall thickness
- Strong outside corners

A well-trained, experienced plastics engineer can help you determine whether thermoforming or rotomolding is right for your project.

Mayfield's engineering support staff has the knowledge and expertise to help with these and other considerations, including:

- Material selection
- Improving geometries
- Concept development
- Final design

And, if rotational molding is the best fit, we can help you find the right rotomolder to meet your project requirements.



Plastic Enclosures, Radomes & Other Thermoforming Applications

Thermoforming can be used to manufacture an endless array of plastic enclosures, trays and other components for a wide variety of markets. Scroll through the list below to get an idea of Mayfield's own specialties in this area and then call us to see how we can make the difference in your next project.

Medical

- Equipment covers
- Sidewalls, user interface panels
- Bezels and enclosures
- Internal components
- Work-in-progress trays
- Hospital room panels

Mayfield has extensive knowledge in manufacturing high quality heavy and thin gauge plastic enclosures, thermoforming products and packaging for the medical industry.

Telecom

Radomes for:

- RVs
- Yachts
- Military aircraft
- Commercial aircraft
- Ground-based operations

We have significant thermoforming experience in the production of all radome shapes and sizes.

Industrial

- User interfaces
- Bezels
- Enclosures
- Plastic housings
- Panels

Diversified

- Bins, totes and bases
- Office furniture and interior panels
- Plastic enclosures for fitness equipment
- Underground pipe supports and housings
- Domes and panels for a variety of industries
- Marine vehicle parts
- Transportation components, plastic covers and enclosures



Plastic Enclosures, Radomes & Other Thermoforming Applications



Plastic Fabrication in Thermoforming

Heavy-gauge thermoforming provides the capabilities to create a wide array of parts, including:

Heavy-gauge

- Plastic enclosures
- Structural bezels
- Radomes
- Covers
- Equipment panels

Thin-gauge

- Packaging
- Medical applications
- Work-in-progress trays
- Food containers
- Seedling trays

Plastic fabrication in combination with heavy-gauge thermoforming provides additional value by creating much larger parts while keeping tooling costs down. CNC, heating and bending, and other plastic fabrication processes can be combined to create a variety of diversified and complex plastic parts.

Mayfield Plastics' plastic fabrication expertise allows us to create the end product that you need for your next project. We also have the capabilities to thermoform materials from the thinnest plastic film to sheets as thick as a half-inch.



Vacuum Forming FAQs

Vacuum forming, a low-cost thermoforming process, offers an economical method of creating large-size, low-volume plastic parts. Thermoforming specialist Mayfield Plastics has all the answers to your vacuum forming questions. Read through the most frequently asked questions below, or call us at **800-339-3476** for more information.

What size of parts can be vacuum formed?

Mayfield has the capabilities to vacuum form parts as small as an ice cube to dimensions as large as 8 feet by 5 feet. Any thermoplastics with the appropriate melt strength can be vacuum formed, and Mayfield Plastics' dedicated staff has the expertise and technical know-how to help you select the best material for your part.

Is design and engineering assistance available for my vacuum-forming project?

Yes. In fact, the high level of design and engineering assistance available from Mayfield sets us apart from other thermoforming companies. From concept to final design, we can improve the geometries of our customers' products, ensuring a better part and better control over costs.

What tolerances are required for radii and draft angles?

The project's specifics and geometries will determine this. Mayfield's experienced engineering support staff is available to help each customer work through the design process to make sure the final vacuum-formed part is the right part for your project.



Vacuum Forming FAQs

Does Mayfield manufacture thermoformed tooling?

Mayfield has the capability to make, maintain and store all tooling in-house. The ability to control all facets of tool making is a huge differentiator for Mayfield Plastics and allows us to manufacture “Custom made Parts with an Elegant Look”

Does Mayfield provide post-operation assembly?

Yes, we provide a wide array of assembly procedures, allowing for the production of large, complex final plastic parts.

What file formats are accepted?

Mayfield largely works with SolidWorks, Cimatron and Mastercam, although we have the ability to import just about any type of file, including IGS.

Can I arrange a tour of Mayfield’s manufacturing facility?

Mayfield Plastics is pleased to welcome all customers, both new and existing, to tour our new 60,000-square-foot facility.



Summary

We hope you found this guide informative and helpful in choosing the right process for your plastic enclosure needs. Please call or email from contact info below for additional information or to discuss your particular design or production challenges.

Mayfield Plastics' engineering support staff can walk you through the design and manufacturing of your part to ensure the best geometries and most efficient processes to meet your bottom line requirements. If your project requires injection molding, we can identify a Mayfield business partner to meet your needs.

Put our plastic expertise to work for you—call at 800-339-3476 to begin the process.

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