# Pressure Forming vs Rotational Molding

## How an experienced thermoformer improves your clear plastic parts

Pressure forming and rotational molding, or rotomolding, both offer advantages for OEMs looking for cost-effective production of large plastic parts. How do you decide which process is right for your application?

An experienced plastics engineer can help you look at the details of your project, so you can make an informed decision. This article covers the basics of each process, comparing their advantages and drawbacks. Learn the key factors you need to consider in your product design.

Discover a real-life example of how Profile's pressure forming replaced rotomolding for a medical device manufacturer to deliver more consistent parts. It's in this case study.

### Rotomolding 101

Rotational molding is often used for large plastic parts. A hollow mold holds the complete three-dimensional shape of a product. A specific amount of powdered plastic resin is placed in the mold.

The entire mold is slowly rotated in two axes 4-20 times per minute as it is placed in a large oven for heating. The heat melts the plastic while the rotation distributes it evenly around the mold. This creates a hollow part.

When the mold is removed from the oven, the plastic hardens. Once cooled, the finished single piece part is removed from the mold. Multiple parts can be molded together and then cut apart.

Polyethylene is the most common material used for rotomolding because of three factors: low cost, thermal stability, and structural integrity after cooling.

Tooling costs for rotomolding are inexpensive compared to blow molding or injection molding. However, they are still more expensive than tooling for pressure forming.

The biggest drawback to rotomolding is the long cycle times compared to other plastic processes. Heating up then cooling down the entire mold means the process can take over an hour to complete. This reduces throughput and uses more energy.

The extended exposure to heat also runs the risk of degrading the plastic, causing discoloration.

### Rotomolding Advantages:

- Hollow parts get molded as one piece, no joining required
- Multiple parts can be formed at one time
- Generally even wall thicknesses
- Outside corners are strong
- Low pressure operation
- Prefinished parts (like metal threads) can be added in the mold

### Rotomolding Disadvantages:

- Requires draft to be able to remove the part from the mold
- Low pressure can make some mold areas hard to reach
- The entire mold must be heated and then cooled
- Heating can be uneven
- Large flat surfaces can end up thinner and distorted, requiring ribs
- Inside corners may be thinner
- Limited material selection
- Long cycle times may degrade some plastics, resulting in inconsistent color
- Can't do sharp corners and edges

### Pressure Forming 101

Pressure forming uses compressed air to force a heated plastic sheet against the tool. Vacuum removes air from the side that contacts the mold. This is essentially a stretching process.

The process uses 40-60 PSI of pressure, more than rotomolding but less than injection molding. Pressure forming most closely rivals injection molding in achieving a high level of molded-in detail.

Only the plastic sheet is heated in an oven, using less energy than rotomolding. Water-cooled tooling hardens the finished part quickly. This reduces cycle times and makes it easier to remove the part.

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Speed to market is a key advantage of pressure forming. It allows faster development as well as shorter cycle times. Modifying the part geometry and tooling are also easier for design changes.

Pressure forming is a single-sided process. Only one side of the tool touches the plastic sheet. Tools for pressure forming use less aluminum and are less expensive than most other plastic processes, including rotomolding. They also last longer with less maintenance.

Twin sheet forming adapts this process to form two heated sheets against opposing tools. The tools clamp together, bonding the sheets at the edges during forming to create lightweight, rigid, hollow parts.

Pressure forming does have limitations. The starting thickness of the sheet must account for the depth or draw of the part, impacting final wall thickness.

Pressure forming is also a two-step process. After forming, the part needs to be CNC trimmed. Backside features on the part, like attachment points, are added during CNC trimming and finishing.

## Pressure Forming Advantages

- Sharp details
- Lightweight parts with good rigidity
- Tighter tolerances
- Requires less draft
- Lower tooling costs
- Design flexibility
- More engineered materials available
- Faster turnaround times
- Faster time to market

*Pressure forming (right) offers the same V0 protection with thinner wall thickness.*

## Pressure Forming Disadvantages

- Only molds one surface at a time
- All parts require trimming
- Deep draw can result in different wall thicknesses
- Backside features like attachment points need to be added afterward

## Final analysis

Rotomolding and pressure forming are effective for making large heavy-gauge plastic parts. They both offer advantages and versatility. Both processes are less expensive than injection molding, although the unit cost is higher. This makes them ideal for low volume programs.

### Pressure Forming vs Rotomolding

| PROFILE PLASTICS. | Pressure Forming | Rotomolding |
|---|---|---|
| Best Fit Applications | Highly cosmetic OEM parts | Large hollow parts, tanks, barrels, dunnage, etc. |
| Key Advantages | Precision fit, sharp details & custom molded-in color | Uniform wall thickness |
| Key Drawbacks | Parts require secondary operations | Heavy part weight, rounded corners, limited detail |
| Manufacturing Energy | Moderate | Intensive |
| Cycle Times | Short | Long |
| Volume (annual) | Medium | Low |
| Material Selection | Any thermoplastic | Limited |
| Attachment points | Secondary assembly | Can be molded-in |
| Tooling Cost | $$ | $$$ |
| Part Cost | $$$ | $$ |

However, pressure forming offers several key advantages which also allow for larger volumes. Most important is tighter tolerances for product consistency. Faster development time and lower tooling costs speed time to market. Faster cycle times increase throughput. And tool flexibility makes product design changes easier.

Ultimately, the comparison is a size to cost ratio.

If your application requires hollow or double wall parts, consider Twin-sheet forming. This thermoforming technique uses two heated sheets and two molds, fusing them together during production to create hollow parts. The process delivers the same advantages as pressure forming.

## Conclusion

Profile's experience and expertise in pressure forming offers OEMs a cost-effective solution for designing and producing large plastic parts.

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