



UNIVERSITY OF LISBON  
INTERDISCIPLINARY STUDIES  
ON SUSTAINABLE ENVIRONMENT AND SEAS

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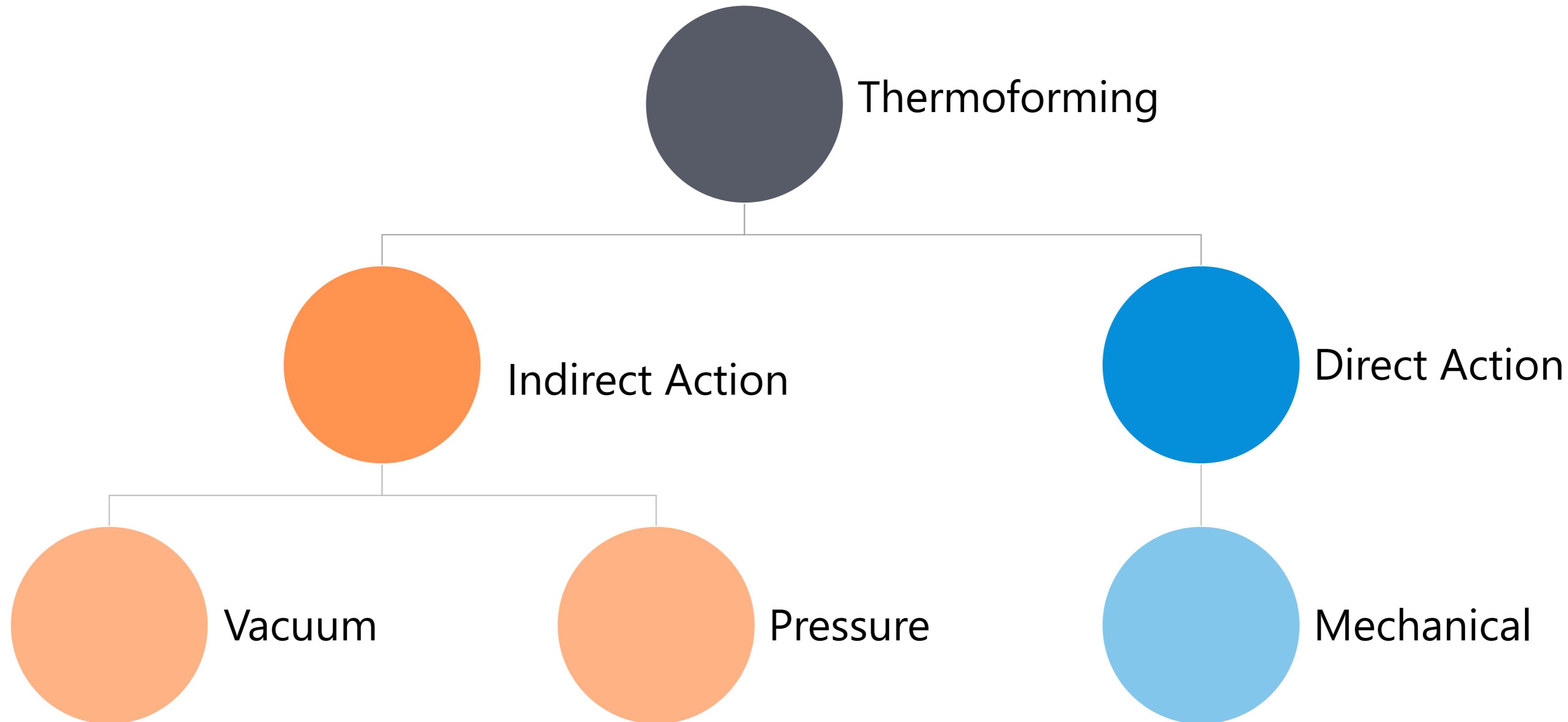




Thermoforming is a process in which a flat thermoplastic sheet is heated and deformed into a desired shape.

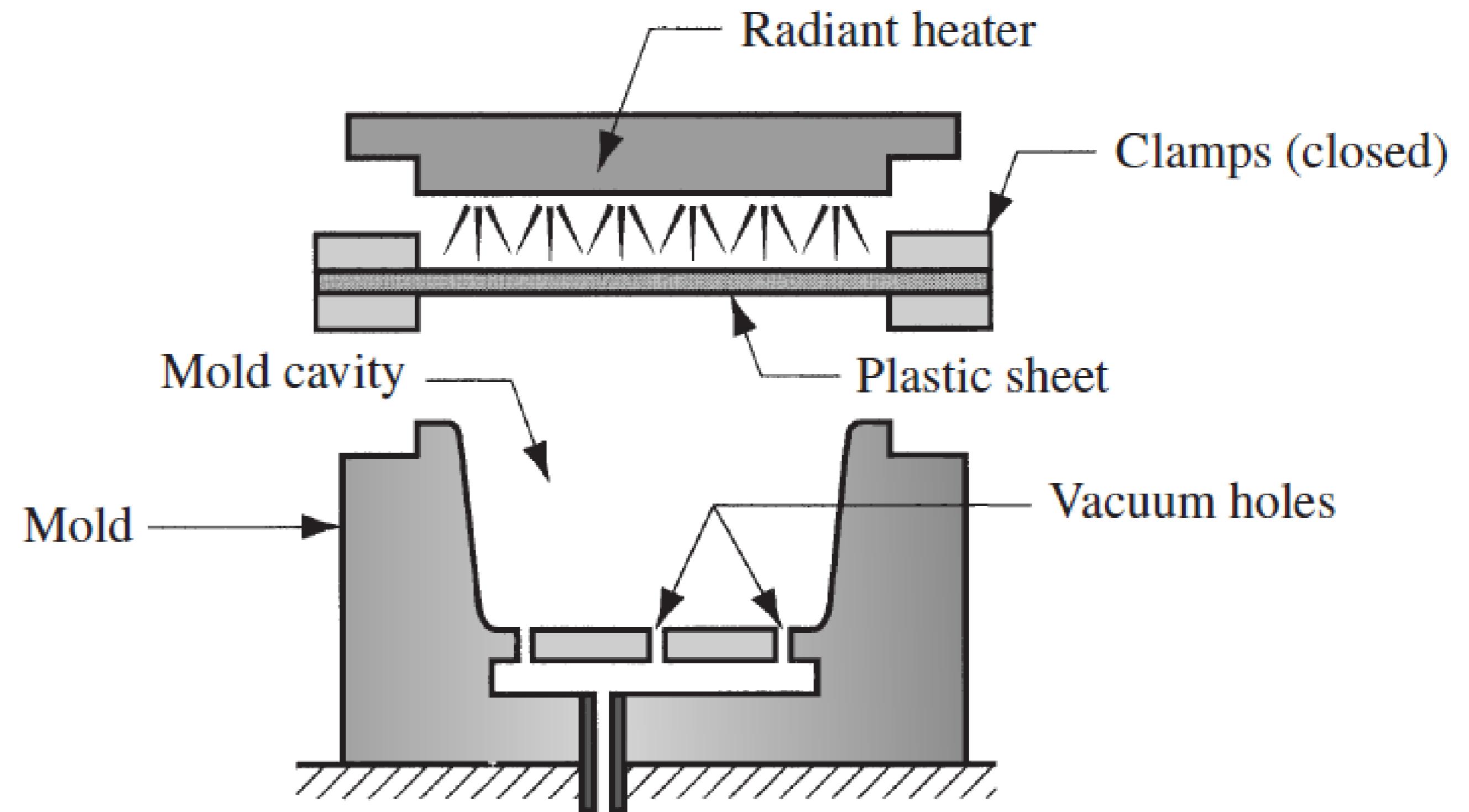
The process is widely used to package consumer products and fabricate large items such as bathtubs, contoured skylights, and internal door liners for refrigerators.





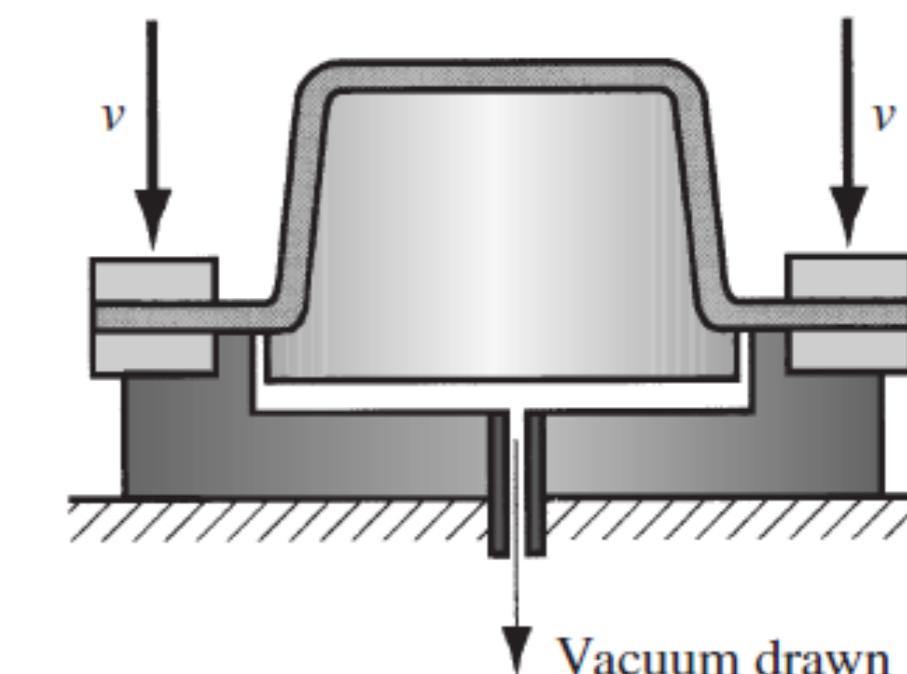
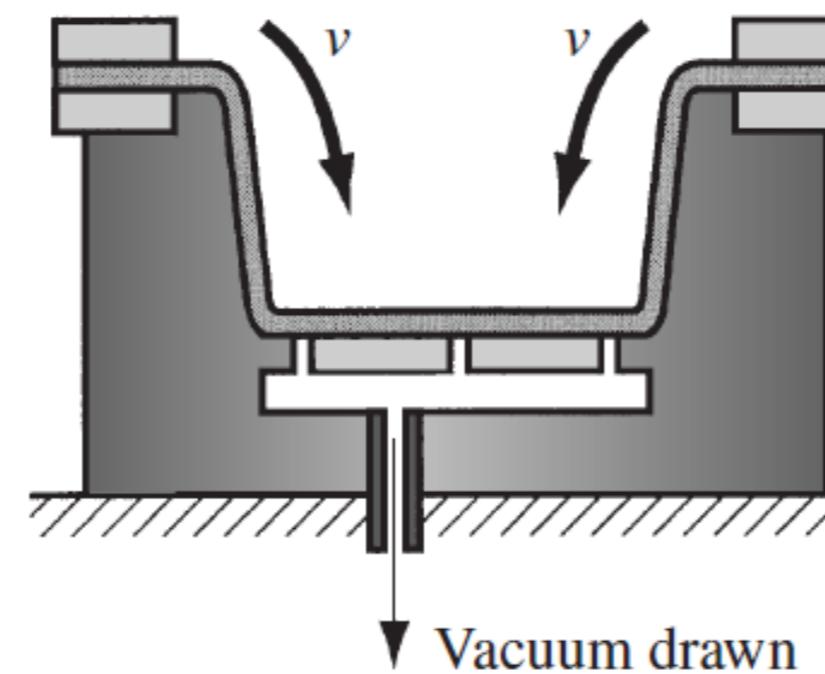
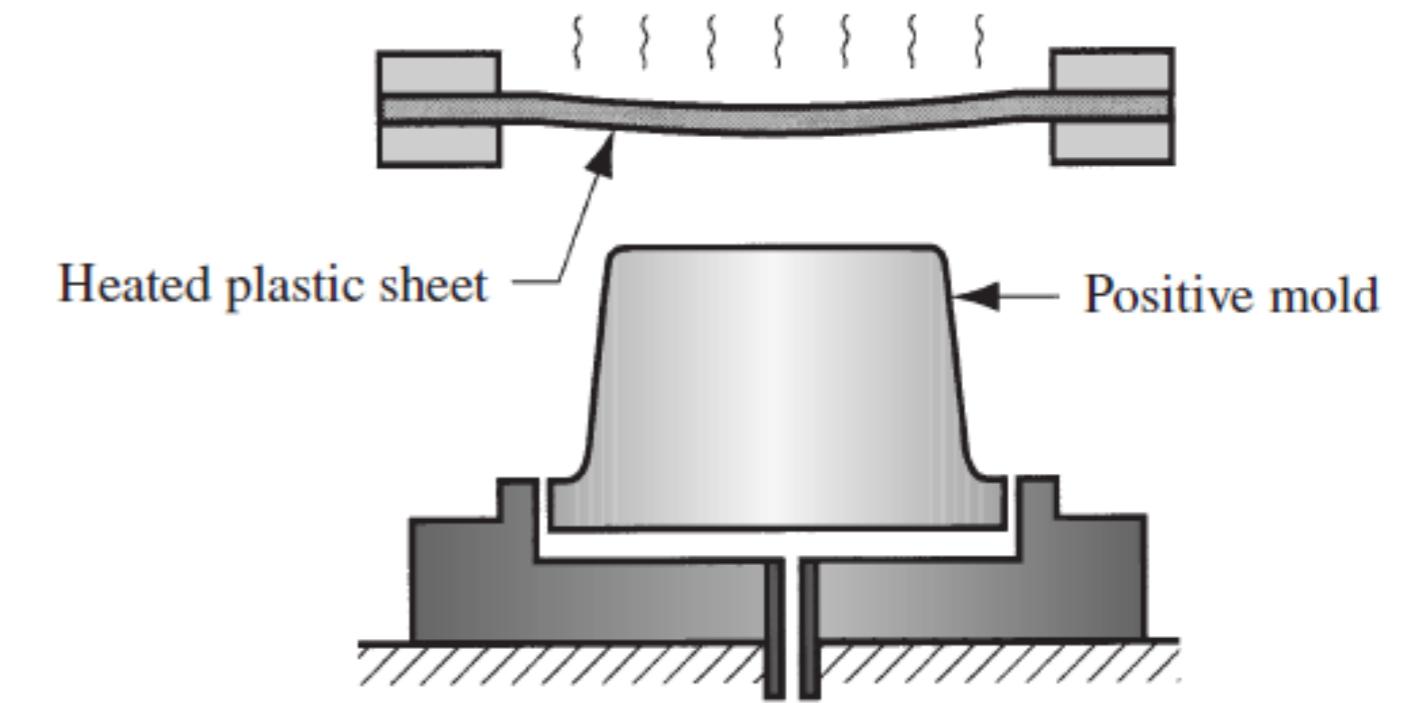
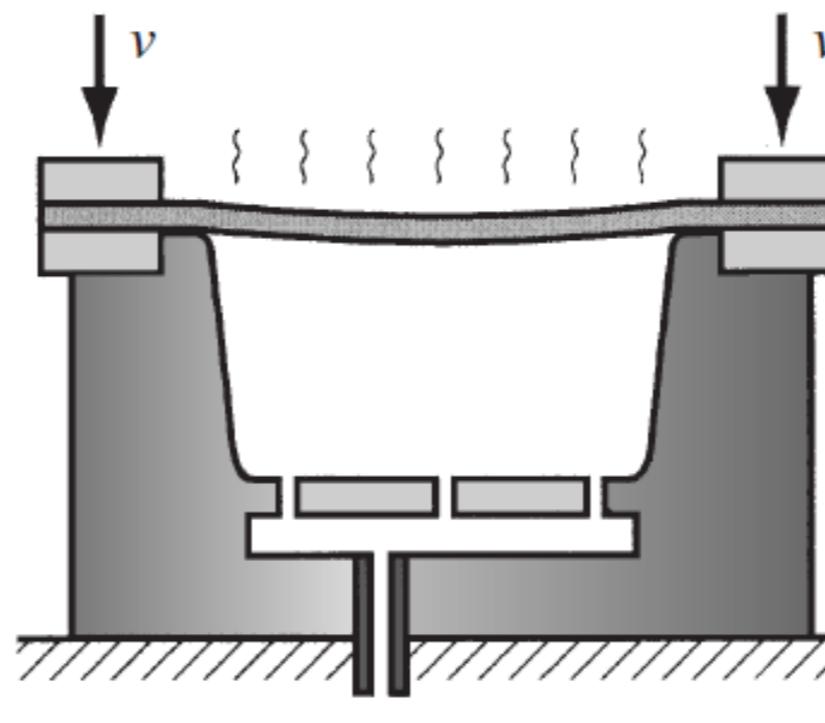
## Indirect Action - Vacuum

1. Sheet cutting + clamping
2. Heating
3. Forming - vacuum
4. Cooling
5. Demoulding
6. Trimming

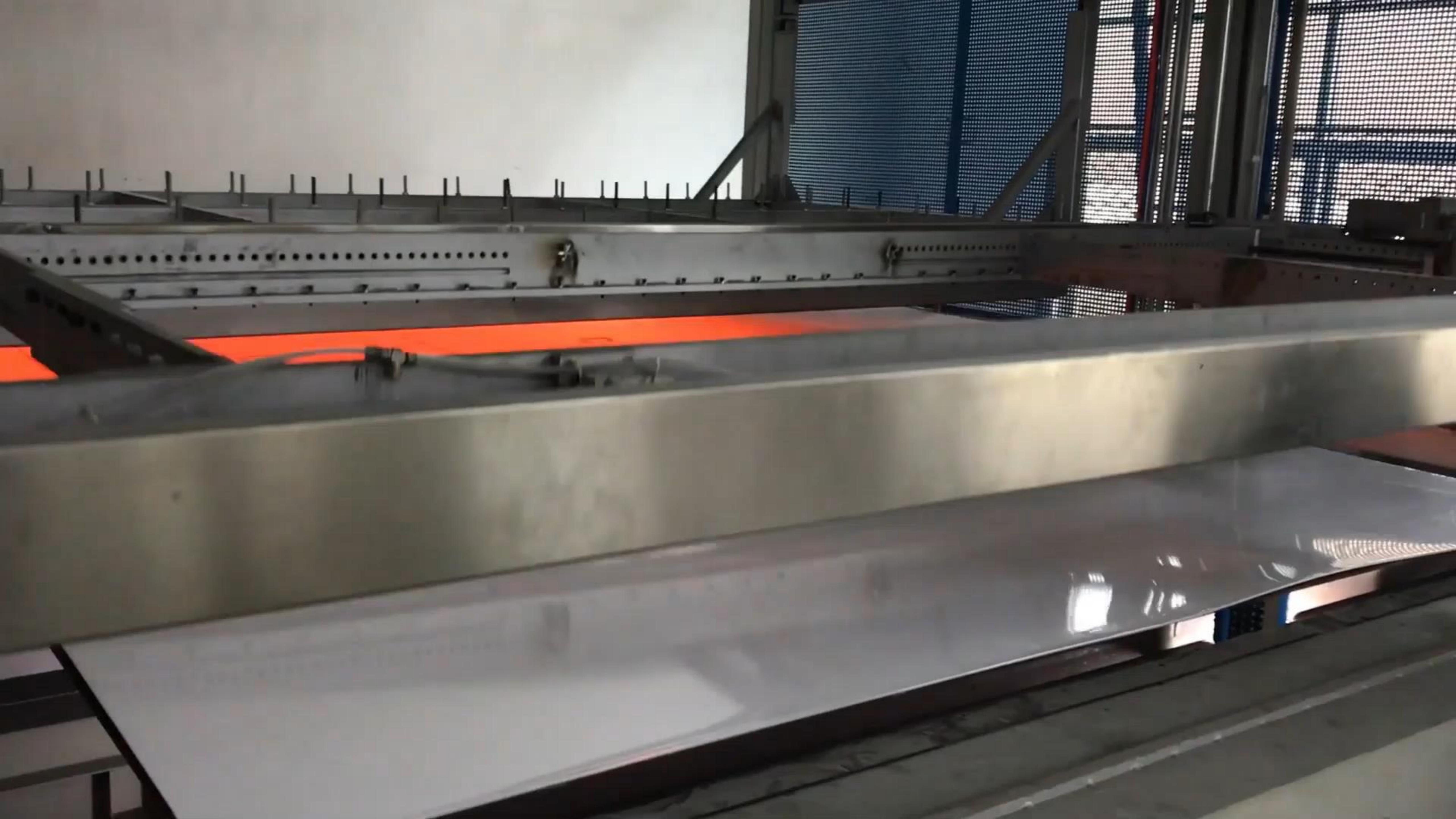


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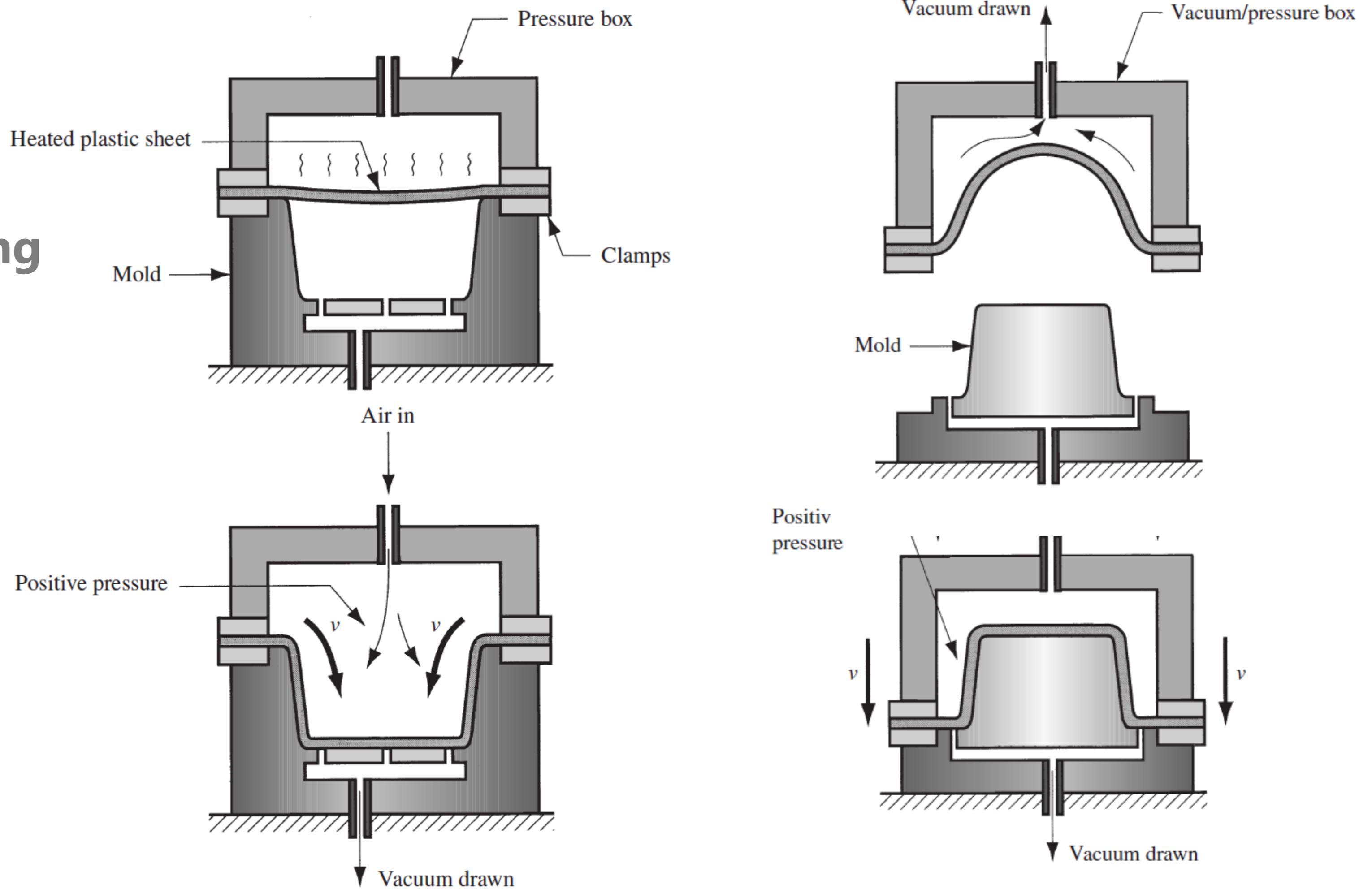






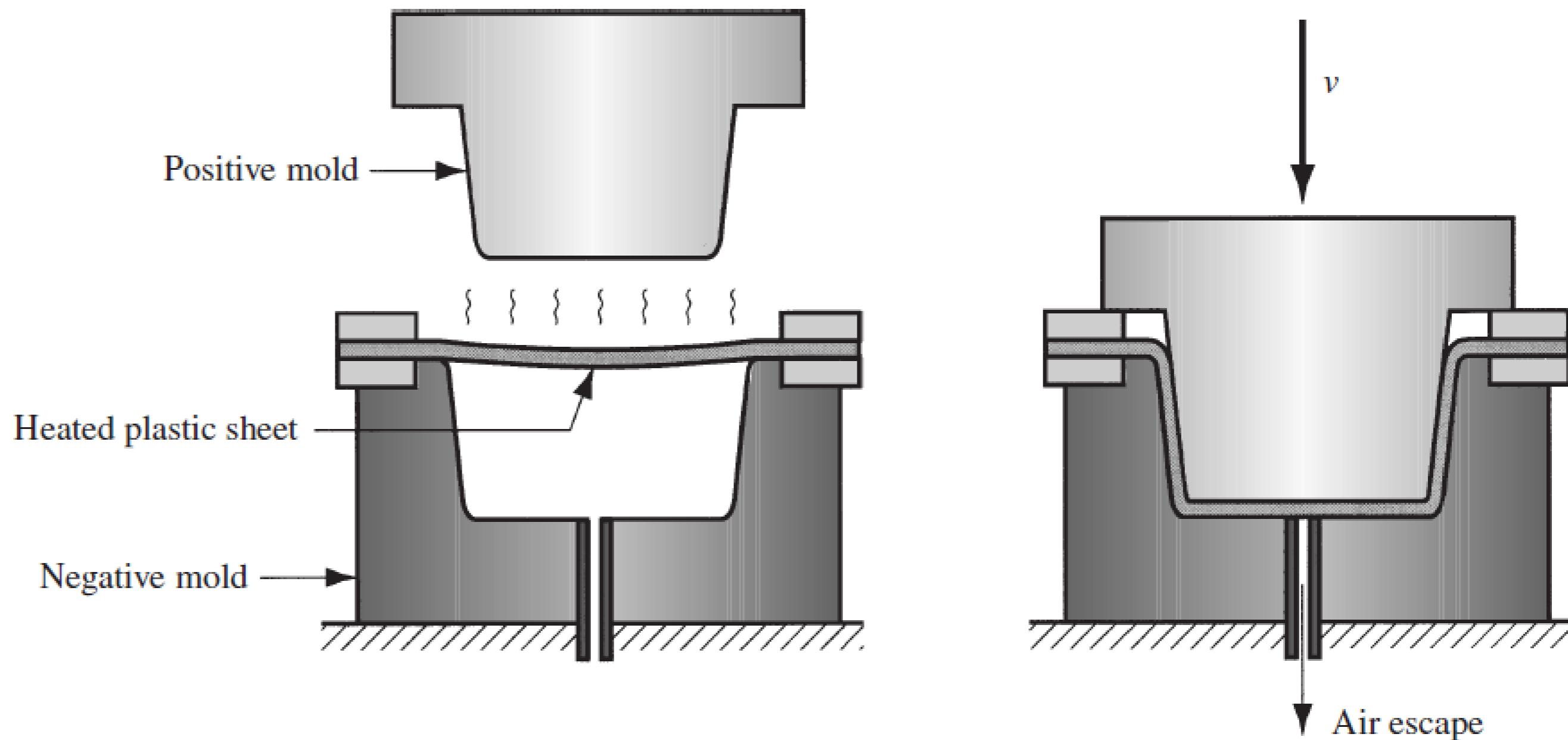
## Indirect Action - Pressure

1. Sheet cutting + clamping
2. Heating
3. Vacuum + pressure
4. Cooling
5. Demoulding
6. Trimming



## Direct Action - Mechanical

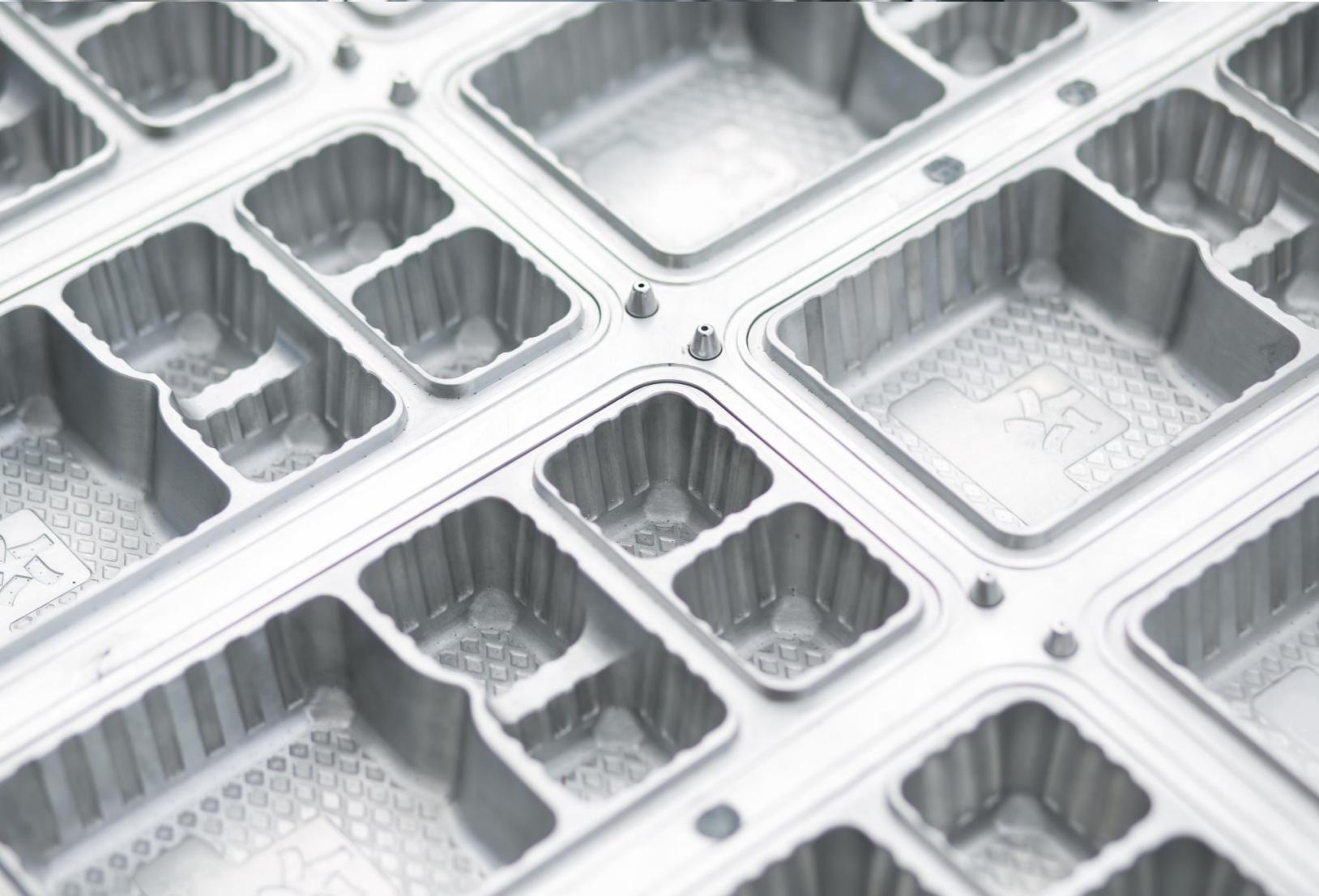
1. Sheet cutting + clamping
2. Heating
3. Forming
4. Cooling
5. Demoulding
6. Trimming



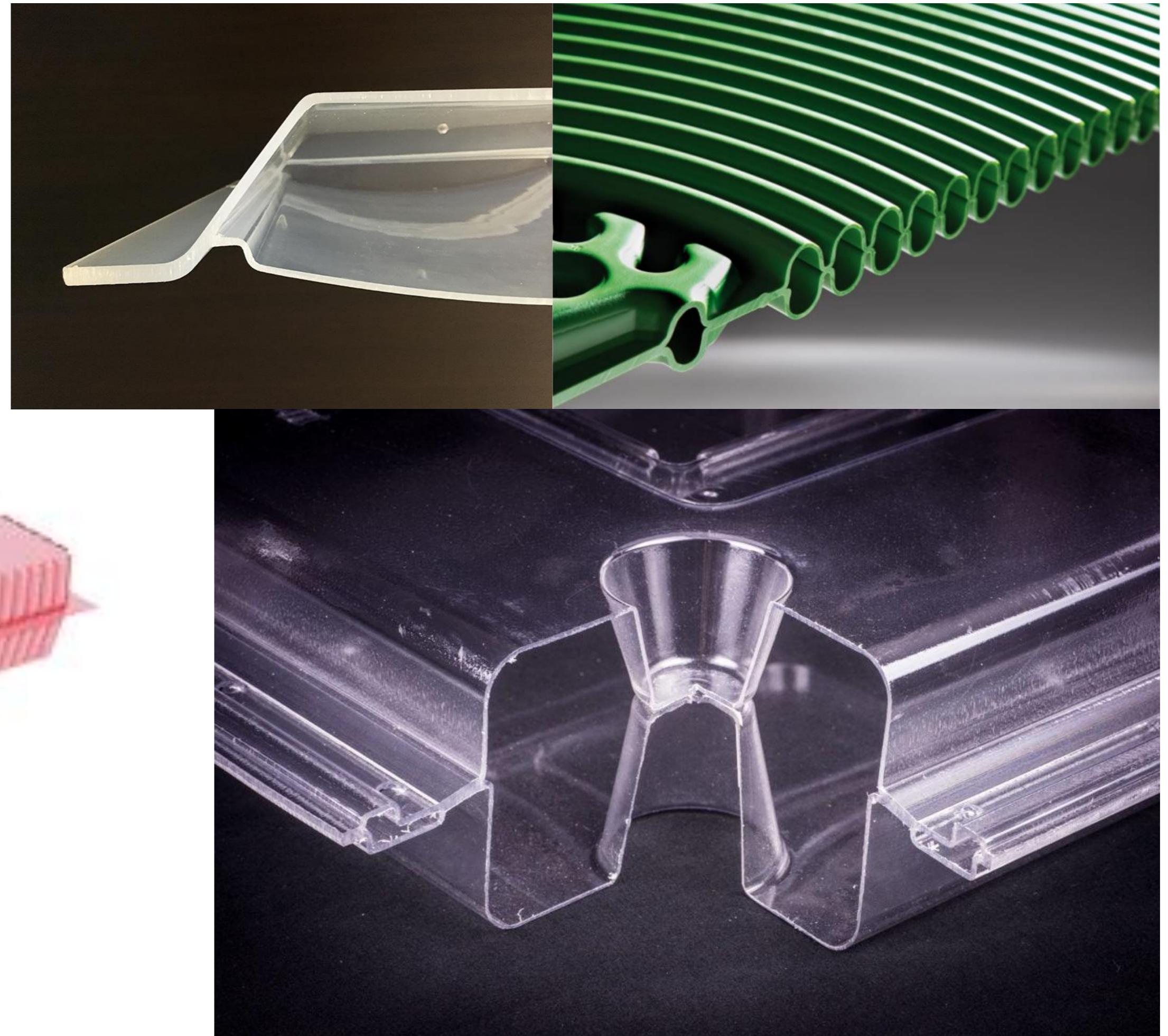
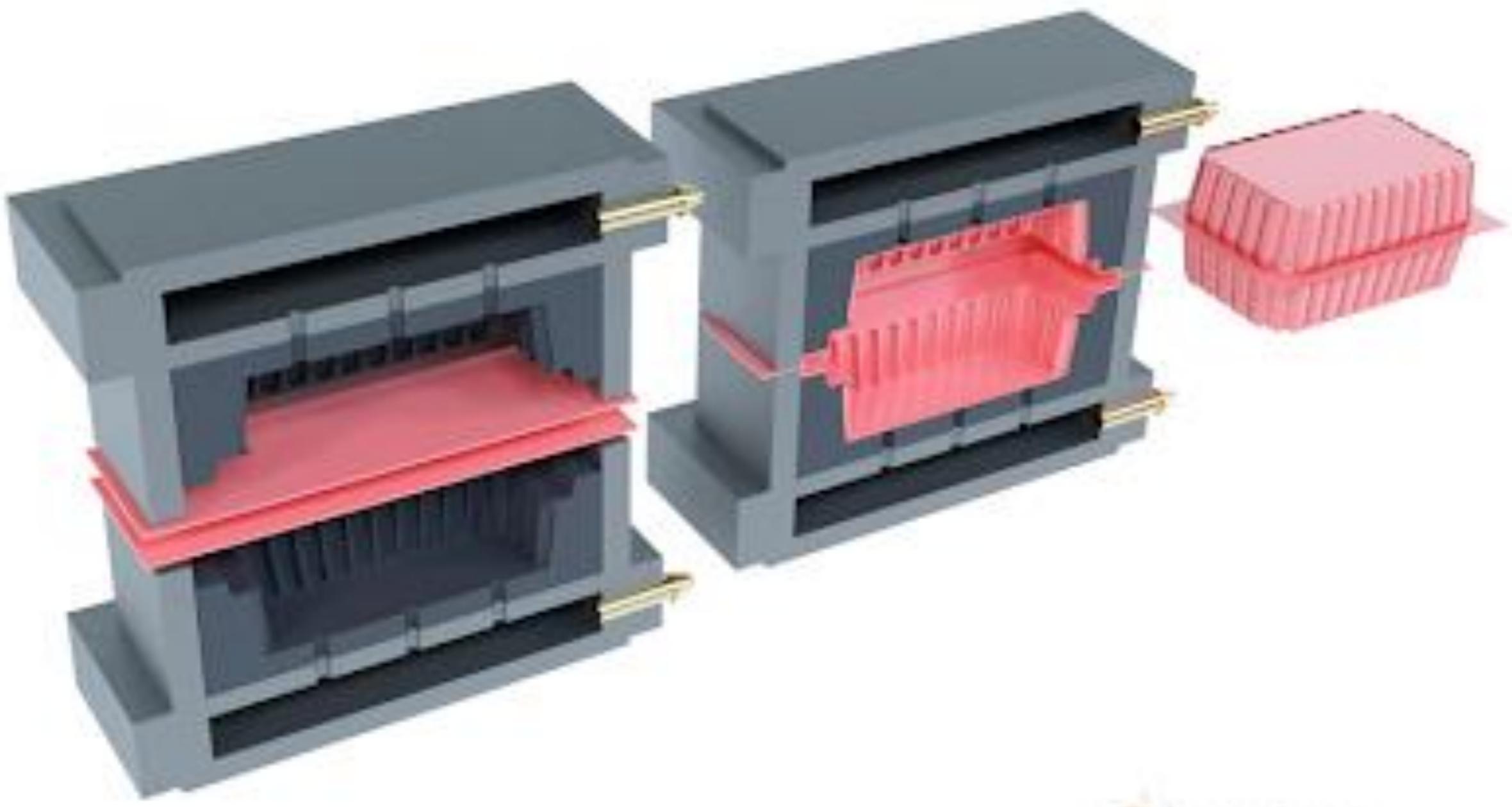


Property of Prothermoform.com

# Thermoforming



## Twin Sheet variant



## Advantages

- Extremely large parts can be produced
- Simple process
- Low cycle
- High quality parts
- Low tooling costs (injection moulding)

## Disadvantages

- Restricted to thin-walled products and without undercuts
- Uneven thickness
- More costly than injection moulding
- Requires more material than other methods

The background of the image is an underwater scene. A large green sea turtle is swimming in the foreground, looking towards the camera. In the water above it, there is a significant amount of plastic waste, including a large plastic bag and several plastic bottles of various colors (blue, green, yellow). The water is a deep blue, and the surface is visible in the background where it meets a sky filled with clouds.

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