Thermo-Forming

PL ET 370

Slide 2

Thermo Forming

- Heated Plastic Sheet
- Transferred to Mold
- Under Pressure/Vacuum/Force
- Sheet Conforms to Mold Detail

Slide 3

Thermo Forming

- Current Areas of Use
  - Packaging
  - Automotive
  - Trays
  - Pallets
  - Building Products
  - Signs
Thermo Forming

- Types
  - Vacuum Forming
  - Basic
  - Plug Assist
  - Pressure Bubble/Billow Forming
  - Pressure Forming
  - Matched Plate
Thermo Forming

- Dual Sheet/Twin Sheet

Thermo Forming

- Pressure Forming

PRESSURE FORMING

Thermo Forming

- Sheet
  - Single Layer
  - Multi Layer
Slide 10

Thermo Forming

- Advantages
  - Low Mold Cost
  - Low Lead Time for Tooling
  - Prototype from Wooden Master
  - Low Part Cost
  - Quick Cycle Time
  - Good Surface Finish (Pressure)
  - Large Parts

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Slide 11

Thermo Forming

- Disadvantages
  - Poor Surface Finish (ex Pressure)
  - Non-Uniform Wall Thickness
  - Trimming
  - Secondary Operations
  - Problems Filling Deep Draw
  - Webbing

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Slide 12

Thermo Forming

- Common Problems Associated with Processing
  - Surface Finish
  - Non-Uniform Wall Thickness
  - Problems with Deep Draw
  - Webbing
Slide 13

Thermo Forming
- New Areas of Use
  - Packaging
  - Large Housings

Slide 14

Thermo Forming
- General Part Design Guidelines
  - Draw Ratio
  - Draft
  - Radii
  - Corner Angle
  - Strengthening Techniques

Slide 15

Thermo Forming
- Draw Ratio
  - Maximum 1:3 without Special Techniques
Thermo Forming

- **Draft**
  - **Female**
    - Typical: 0.5° to 5.0°
    - Average: 1.0° to 2.0°
  - **Male**
    - Typical: 2.0° to 8.0°
    - Average: 4.0° to 6.0°

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Thermo Forming

- **Radii**
  - **Inside Corners**
    - Minimum: 0.25 W
    - Recommended: 1 W
  - **Outside Corners**
    - Minimum: 0.75 W
    - Recommended: 4 W

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Thermo Forming

- **Corner Angles**
  - 90° or Better Preferred
Thermo Forming

Strengthening Techniques

Tooling Considerations
- Which Side needs Detail
- Detail on Both Sides
- Which Side needs Better Tolerance
- How will Part fit with other Parts
- Male Molds are Less Expensive

Mold Materials
- Wood & Cast Epoxy for Limited Production
- Cast Aluminum
- Machined Aluminum
Thermo Forming

- New Technology
- CAE Analysis