5/13/2009

Nanostream Project: Process Cost Tradeoff Analysis

Summary:

Dinsmore & Associates, Inc. has created a cost tradeoff table for review. As expected, there are some interesting data: The highest tooling cost process yielded the lowest part cost and the lowest tooling cost process yielded the highest part cost. Currently, we are recommending the Urethane Casting process for your parts because of the limited number of components to be manufactured. Material spec sheets to be provided.

Process Cost Data:

General trend as reported by industry trade group and sample data:

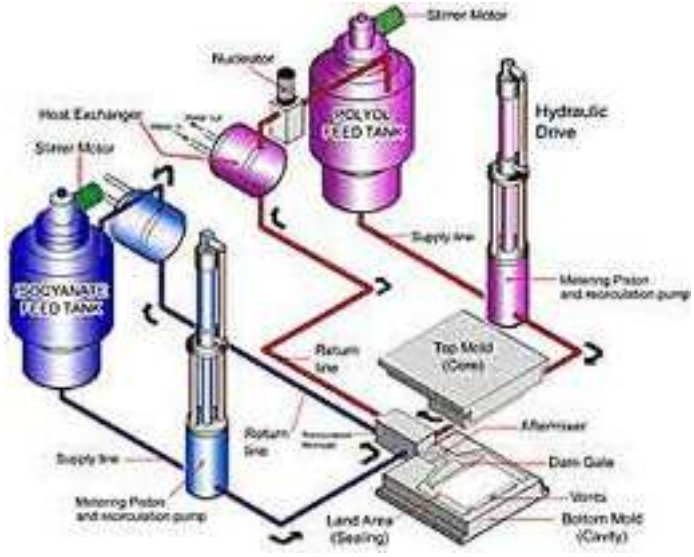
For actual part cost data for the Nanostream project, please reference quote #11-1201rev2

Process Definitions

Reaction Injection Molding _ RIM

What is RIM

Reaction Injection Molding (or RIM) is a process in which two reactive liquid components -- a polyol and an isocyante - are metered, blended together, and injected into a closed mold at low pressure. The two materials fill the mold easily because they have a viscosity similar to that of water. The chemical reaction between the two components forms a polyurethane structural foam part with a dense, durable skin and a low density cellular core.



Process Characteristics

- Part Cost - Moderate to high
- Tooling Cost – Mid range
- Production Rate - Moderate
- Parts can be molded in color with good surface finish
- Material can be reinforced
- Material is very impact resist

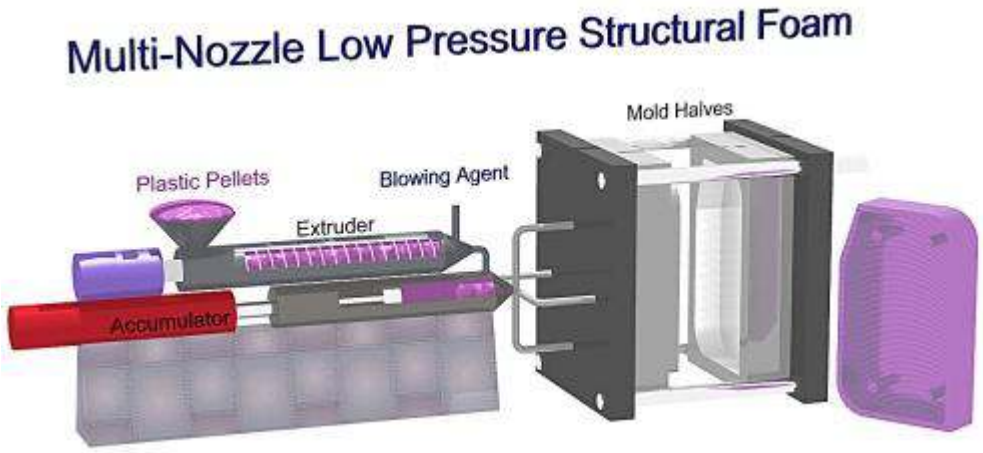
Examples:



Structure Foam Molding

What is Structure Foam Molding?

Structural Foam Molding is a low-pressure injection molding process that is capable of producing very large structural parts. The molten plastic material is injected into a mold after being mixed with a blowing agent or high-pressure gas. This produces bubbles in the plastic causing it to foam. The foam retains the properties of the plastic but weighs less because of reduced density.



Process Characteristics

- Part Cost - moderate
- Tooling cost - moderate - high Low pressure allows use of less expensive tooling
- Production rate - moderate to high
- Multiple nozzles are possible in a single part to allow large surface areas.

- Parts have a swirl pattern so they must be finished for cosmetic purposes
- Parts can be molded with thick cross sections
- Sink marks are reduced
- Process can produce parts up to 100 lbs. and 12 ft. x 10 ft. in area

Examples:

Thermoforming

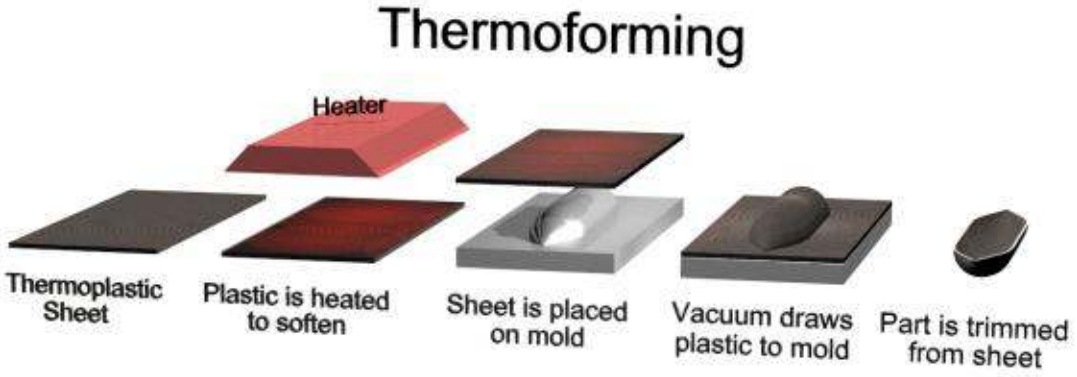
What is Thermoforming?

Vacuum forming and pressure forming are Thermoforming processes.

Vacuum forming is accomplished by taking a flat piece of plastic, heating it until it softens, then using a vacuum to pull it onto a contoured surface where it is held until it cools and hardens. Tooling costs for this process are the lowest of any plastic molding process.

Pressure forming is vacuum forming that uses air pressure to assist the vacuum. This results in much better definition on the part surface.

Twin sheet forming is two pressure or vacuum forming operations occurring simultaneously, which are joined to produce an integrally welded hollow part.



Process Characteristics

- Part Cost - moderate to high
- Tool Cost - Low
- Production Rate - low
- Capable of producing very large parts.
- Parts are molded without stress, so they are very stable

Examples: