Resin casting

Description

Process schematic

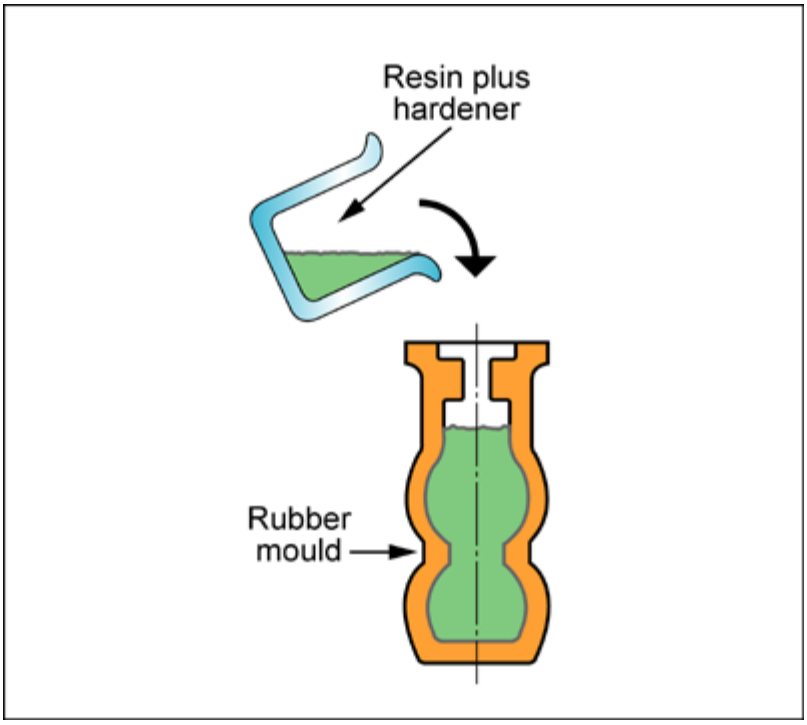


Figure caption

Resin casting

The process

Many resins are sufficiently fluid before polymerization that they can be cast. In RESIN CASTING a mix of resin, hardener and catalyst is poured into a shaped mold without applying pressure. If the part is small the mold can be made of an elastomer, allowing complex cast shapes to be removed without having a split mold. A few thermoplastics - notably acrylics - and most thermosets can be cast.

Material compatibility

Polymers - thermosets	✓

Shape

Circular prismatic	✓
Non-circular prismatic	✓
Solid 3-D	✓
Hollow 3-D	✓

Economic compatibility

Relative tooling cost	low
Relative equipment cost	low
Labor intensity	medium
Economic batch size (units)	1 - 500

Physical and quality attributes

Mass range	0.1	-	700	kg
Range of section thickness	6.25	-	600	mm
Tolerance	0.8	-	2	mm
Roughness	0.5	-	1.6	µm
Surface roughness (A=v. smooth)	A			

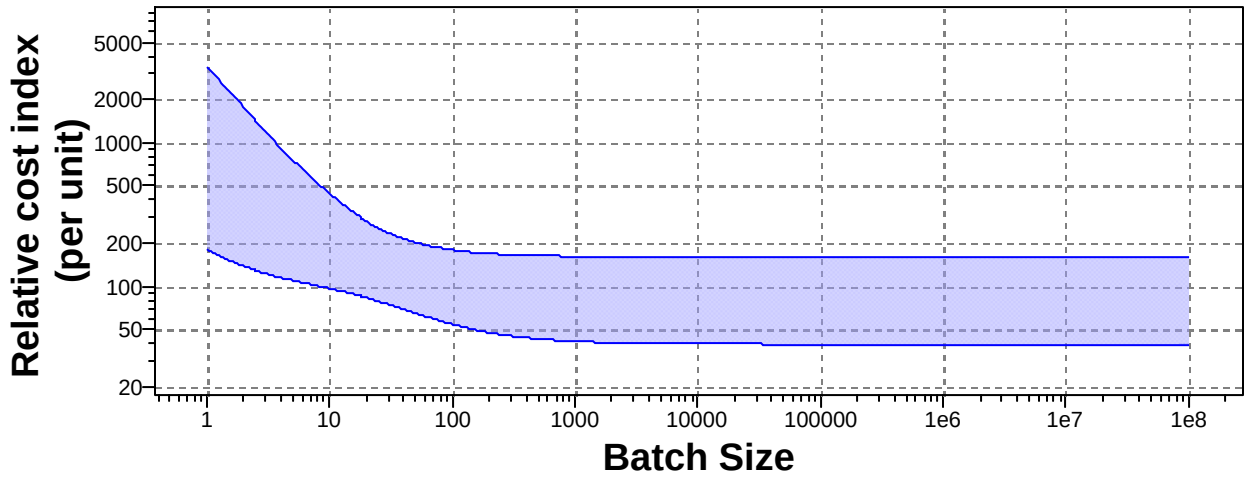
Process characteristics

Primary shaping processes	✓
Discrete	✓

Cost model and defaults

Relative cost index (per unit)	* 41.4	-	162	

Parameters: Material Cost = 8USD/kg, Component Mass = 1kg, Batch Size = 1e3, Overhead Rate = 150USD/hr, Discount Rate = 5%, Capital Write-off Time = 5yrs, Load Factor = 0.5



Material Cost=8USD/kg, Component Mass=1kg, Overhead Rate=150USD/hr, Capital Write-off Time=5yrs, Load Factor=0.5, Discount Rate=5%

Capital cost	* 492	-	4.92e3	USD
Material utilization fraction	* 0.85	-	0.95	
Production rate (units)	* 1	-	5	/hr
Tooling cost	* 82	-	3.28e3	USD
Tool life (units)	* 1e3	-	1e4	

Supporting information

Design guidelines

The optical properties of cast transparent polymers like acrylics are better than if molded. Fillers can be added, but for this a similar process - centrifugal casting - is frequently used. Large parts and large section thicknesses are common, but the quality of the final part depends heavily on the skill of the operator - trapped air and gas evolution are both potential problems.

Technical notes

In casting methyl methacrylate (acrylic), a monomer-soluble initiator is used. The reaction is vigorous and liberates much heat that must be dissipated to keep the temperature within safe limits and prevent the monomer from boiling. Considerable shrinkage occurs - as much as 21% for methyl methacrylate - and must be taken into account when designing molds for casting. Using monomer-polymer syrups made by interrupted polymerization helps control both heat and shrinkage.

Typical uses

Elevator buckets, bearings, large gears, sheets, tubes, electronic encapsulation, rod stock, bowling balls, epoxy tooling; centrifugal casting is used for pipes, tanks and containers.

The economics

The tooling required is cheap; stiff (metal or epoxy) or flexible (elastomer) molds are both possible. For small tooling the price is under $100, for large tooling it is a few thousand dollars.

The environment

Most polymers give off vapors when curing - adequate ventilation is

Links

MaterialUniverse

Reference