

Description

Image



Image caption

(1) Transmission drive gears © Blickpixel at Pixabay [Public domain] (2) Interior view with cores for valve molding. Stockham Pipe and Fittings Company, Grey Iron Foundry © Library of Congress Prints and Photographs Division Washington at Wikimedia Commons [Public domain] (3) Stainless steel tap water © Ron Porter at Pixabay [Public domain]

The process

The CERAMIC SHELL EVAPORATIVE MOLD (REPLICAST) process combines the advantages of investment casting and the EPC (evaporative pattern) processes. An expanded polystyrene pattern is made as in the EPC process and then is coated with a ceramic layer as in investment casting. The mold assembly is fired at 1000C which burns off the pattern and produces an inert shell, which is supported in a sand bed during casting. The use of expanded polystyrene for the pattern enables large, light weight patterns to be produced. The process gives many of the benefits of investment casting -- especially surface finish and tolerances --and extends the size range for investment casting.

Process schematic

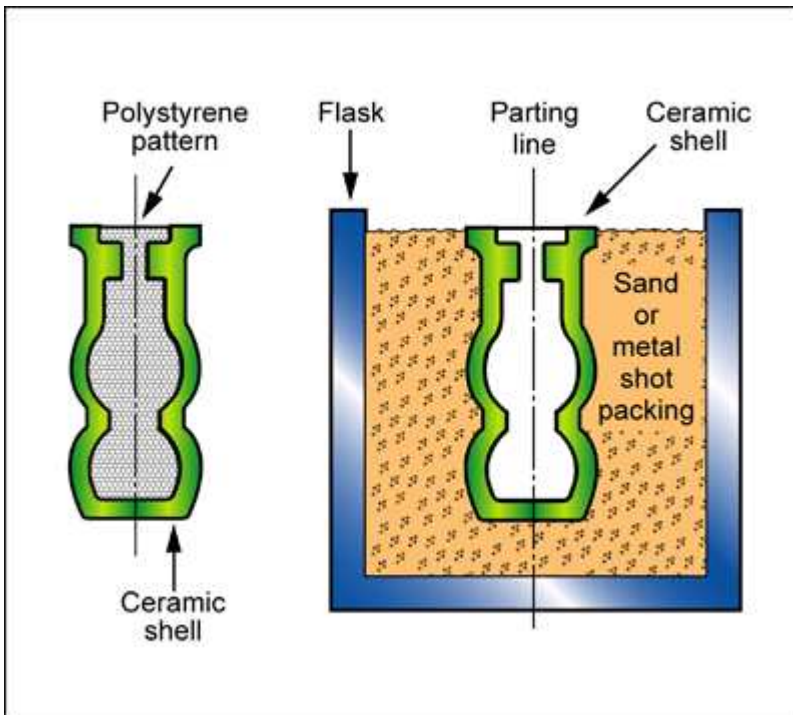


Figure caption

Ceramic mold evaporative mold casting.

Tradenames

Replicast process

Material compatibility

Metals - ferrous	✓
Metals - non-ferrous	✓

Shape

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

Economic compatibility

Relative tooling cost	low
Relative equipment cost	medium
Labor intensity	medium
Economic batch size (units)	50 - 1e4

Physical and quality attributes

Mass range	2.2 - 110 lb
Range of section thickness	118 - 2.95e3 mil
Tolerance	9.84 - 19.7 mil
Roughness	0.063 - 0.126 mil
Surface roughness (A=v. smooth)	B

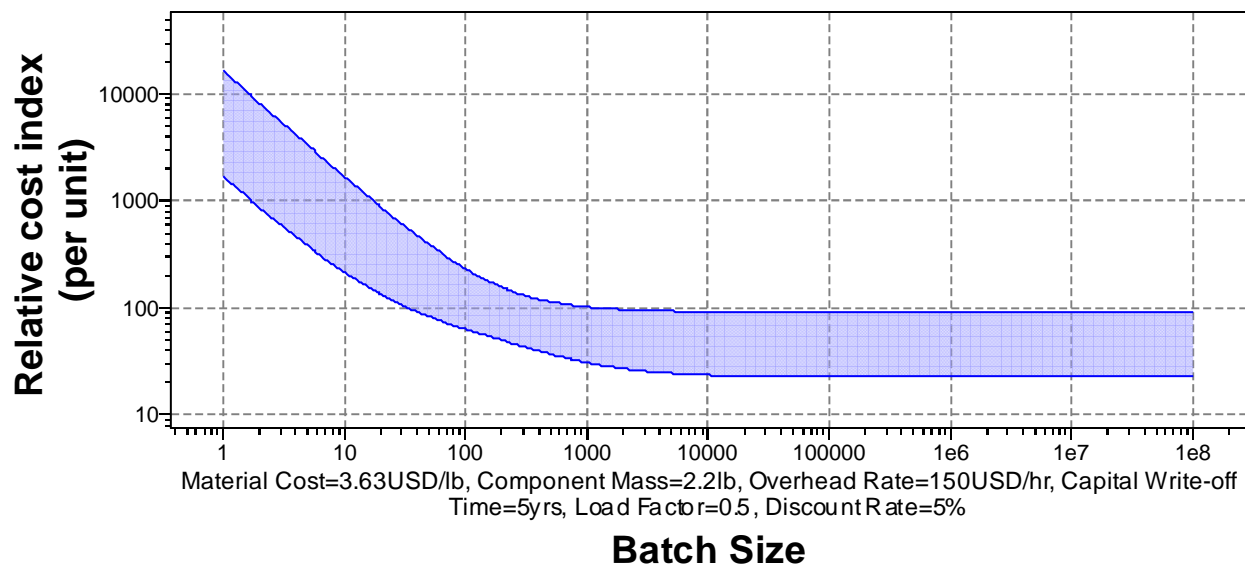
Process characteristics

Primary shaping processes	✓
Discrete	✓

Cost model and defaults

Relative cost index (per unit)	30.9 - 103
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[Parameters:](#) Material Cost = 3.63USD/lb, Component Mass = 2.2lb, Batch Size = 1e3, Overhead Rate = 150USD/hr, Discount Rate = 5%, Capital Write-off Time = 5yrs, Load Factor = 0.5



Capital cost	8.2e3	-	4.92e4	USD
Material utilization fraction	0.6	-	0.8	
Production rate (units)	2	-	20	/hr
Tooling cost	1.64e3	-	1.64e4	USD
Tool life (units)	1e3	-	1e4	

Supporting information

Design guidelines

Because no cores are required, complex shapes can be produced. Undercuts and reentrant angles are

Technical notes

The process is applicable to a wide range of alloys. However, it is used mainly in the production of steel castings. It is suitable for low alloy and stainless steels. No mold joint line, which reduces finishing requirements.

Typical uses

Valve castings, drive sprockets, truck suspension supports, castings for the food industry and for military

The economics

The tooling cost range listed above covers small, simple to large, complex

The environment

Expanded Polystyrene is combustible. Proper ventilation is essential and good standards of housekeeping and safety should be maintained. Several major contaminants are formed.

Links

MaterialUniverse

Reference