Metal Spin Casting Applications for Objet Models

Skill Level Time Cost

SPIN CASTING APPLICATIONS

One of the most exciting modern applications of spin casting technology is its use in rapid prototyping and product development. It is ideal for quickly and economically producing numerous fully functional, fragile parts in high-strength metal or plastic from computer-generated RP models. Product designers can then subject multiple parts to thorough testing and evaluation in their intended applications. With the new rubber mold materials now available, molds can be made and prototypes or development parts cast in as little as three hours. Even complex parts usually take less than one day. Thus, design changes in size, function, fit or appearance can be quickly reproduced without requiring a large investment in tooling or machine time.

Figure 1: Casting of fashion acessories


Figure 2: Casting of functional parts


Figure 3: Examples of thin-walled parts

SPIN CAST ADVANTAGES

- Achieve a competitive edge with faster "time to market" capabilities
- No costly metal tooling required
- Same-day results with in-house control
- Simple to use technology
- Increase productivity – provides 30-50% more casting cycles per hour, per operator
- No heavy mold cover plate – to handle each cycle
- No lift-over of molds
- Automatically adjusts for mold height – no manual adjustments needed
- All mold handling done at waist level

MAXIMUM PART SIZE

The maximum part size that can be cast using spin cast technology is 100 x 50 x 35mm (L x W x H) with nominal wall thickness of 2.5mm (min.) to 6.5mm (max.).

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METALS THAT CAN BE CAST

ZINC: Commercial grade **zinc-based alloys**, derived and modified from standard zinc pressure die cast alloys. Zinc alloys are often used as direct replacements for aluminum, iron, copper and low grade steel-based alloys to provide similar strength and/or reduced cost on the same application.

Zinc alloys readily accept a wide variety of decorative and corrosion-resistant surface finishes. They can be painted to match adjacent parts, externally dyed in a variety of colors or chrome plated for a hard, durable finish. They can also be fully electroplated to take on the appearance of brass, bronze, stainless steel, silver, chrome or gold, etc.

HIGH TIN, WHITE METAL & LEAD ALLOYS *Containing no lead or cadmium.*
Lightest tin-based alloy for jewelry casting. Highest degree of strength, whiteness and brightness. Castings do not need to be plated. Suitable for intricate shapes, filigree, textured surfaces and for pronging and model making. Normal casting temperatures range from 274 – 330˚C.

Special grade, ready to use zinc-aluminum-copper alloy.

This is the most popular spin-casting zinc alloy, ideal for medium-sized parts up to 1kg each, with wall thickness of 16mm or under. Produces a very fine-grain, smooth-surfaced finish with excellent detail and very low porosity. Has high strength and hardness and is fully electroplatable. Normal casting temperatures range from 400 – 420˚C. Provides a very long mold life, usually 30% longer than other commercial grade zinc alloys.

Figure 4: Casting Objet models

Figure 5: The rubber master mold

Figure 6: The cast models

SIX EASY STEPS

STEP 1

PREPARING THE MOLD

Parts or models are laid out on a disc of uncured silicone rubber. Depending upon model/pattern thickness and shape, cavities may be cut or molded by hand to accommodate the part. The uncured silicone material is soft and pliable like clay. The mold parting line is formed at this stage and can be built up or lowered around any section of the model/pattern. Parts of any complexity can be handled. Cores and pull-out sections can also be easily incorporated, if required. Mold parting compound is sprayed on the mold and "acorn" nuts are arranged around the edge where (like pins of a die) they precisely position the mold halves in line with each other.

Figure 7: Preparing the mold

STEP 2

VULCANIZING THE MOLD

After preparation, the mold is placed in a vulcanizing frame. This frame is placed in the heated vulcanizing press for curing. The combination of heat and pressure forces the silicone into all crevices and around all details of the model/patterns.
The heat cross-links and cures the silicone. The resulting mold is tough, resilient, dimensionally accurate, and heat and chemically resistant.
After vulcanization the mold is easily flexed to release the patterns (and later, parts) from the cavities. This is true even for patterns with many undercuts.

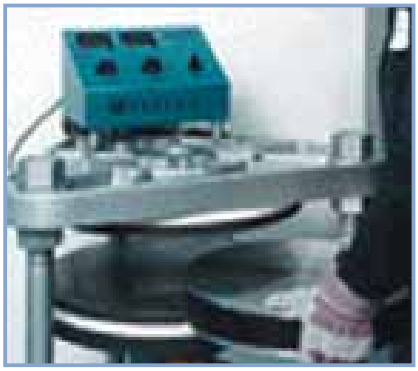

Figure 8: Vulcanizing the mold

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STEP 3
GATING & VENTING

The gates, runner system and air vents are easily cut into the cured rubber mold with a sharp knife or scalpel. Air vents may also be drilled into the cavity to aid in venting of trapped air or gases.
Similar gating and venting systems are used for metals and for plastics, so both materials can be cast in the exact same mold for evaluation, if desired.

Figure 9: Gating & venting

STEP 4
PLACING THE MOLD IN THE SPIN-CASTER

The mold is placed into the casting unit – the front-loading unit shown.
The mold is automatically centered and closing the door activates a pneumatic mold clamp.
Spin speed, clamping pressure and cycle time are fully adjustable with the solid state digital controls.

Figure 10: Placing the mold in the spin-caster

STEP 5
POURING & SPIN-CASTING

After the spin cycle starts, the liquid metal, plastic or wax is poured into the casting unit.
Pressure caused by centrifugal force pushes the liquid through the mold's runner system, completely filling every section, corner, detail and surface finish in each mold cavity.

Figure 11: Pouring & spin-casting

STEP 6
REMOVAL OF SPIN-CAST PARTS

After metals solidify and plastics set, the parts are quickly removed from the mold. With metal, 50 to 60 cycles per hour are usually required; with plastic or wax, 8 to 12 cycles per hour are typical.
The gates, runners and vents are easily broken away by hand. Castings are ready for assembly, for painting, planting or coating, with no additional clean-up needed. Spin casting is a precision casting process producing high-integrity, close-tolerance parts comparable to die casting or plastic injection techniques.

Figure 12: Removal of spin-cast parts

References: www.nicem.it
www.tekcast.com

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COMPARE SPIN CASTING TO OTHER PROCESSES

PROCESS	SPIN CASTING	DIE CASTING	PLASTER MOLD CASTING	SAND CASTING	LOST-WAX INVESTMENT CASTING	PERMANENT MOLD CASTING	GRAPHITE MOLD CASTING	PLASTIC INJECTION MOLDING
Type of Molds Used	Vulcanized "TEKSIL" Rubber	Machine Tooled Steel	Plaster	Sand	Ceramic	Machined Iron, Steel	Machined Graphite	Machined Aluminum, Brass or Tool Steel
Type of Casting Materials	Zinc, Tin/Lead, Polyurethane, Polyester, Epoxy, Pattern Wax	Zinc, Aluminum, Magnesium	Most Nonferrous Metals	Most Foundry Castable Metals	Most Foundry Castable Metals	Zinc, Aluminum, Magnesium	Zinc	Most Thermo-Plastics
Average Cost of Mold Tooling (U.S.Dollars)	$35 to $250	$10,000 to $250,000+	$1,000 to $25,000 (Wood or Metal Pattern)	$500 to $10,000 (Wood or Metal Pattern)	$1,000 to $25,000 (Machined Aluminum)	$5,000 to $150,000+	$2,000 to $30,000	$5,000 to $150,000+
Ordering Quantities	1 & Up	25,000* & Up	100 & Up	100 & Up	1,000 & Up	10,000* & Up	5,000 & Up	15,000* & Up
Part Size (Length or Width)	‹ 1/2" - 12" ‹ 1.25 - 30 cm	‹ 1/2" - 24" ‹ 1.25 - 60 cm	‹ 4" - 36" ‹ 10 - 90 cm	‹ 3" - 36" ‹ 7.5 - 90 cm	‹ 1" - 24" ‹ 2.5 - 60 cm	‹ 4" - 24" ‹ 10 - 60 cm	‹ 4" - 24" ‹ 10 - 60 cm	‹ 1/2" - 24" ‹ 1.25 - 60 cm
Wall Thickness	‹ 1/8" - 1/2" 0.3 - 1.25 cm	‹ 1/8" - 3/4" 0.3 - 2 cm	‹ 1/8" - 1" 0.3 - 2.5 cm	‹ 1/4" - 1" 0.6 - 2.5 cm	‹ 1/8" - 1" 0.3 - 2.5 cm	‹ 1/4" - 1" 0.6 - 2.5 cm	‹ 1/4" - 1" 0.6 - 2.5 cm	‹ 1/8" - 1/2" 0.3 - 1.25 cm
Casting Tolerances	Very Close	Closest	Close	Lowest	Very Close	Loose	Loose	Closest
Ability to Make Design Changes	Easiest	Very Difficult	Difficult	Easy	Very Difficult	Difficult	Difficult	Very Difficult
Per Part Cost	Very Low	Lowest	Very High	Very Low	Highest	Low	High	Lowest
Usual Secondary Machining Required	Very Little or None	Lowest or None	Low	Highest	Very Little or None	Low	Low	Lowest or None
Usual Initial Parts Lead Time Required	4 hrs - 2 days	12 - 24 weeks	6 - 12 weeks	4 - 12 weeks	8 - 16 weeks	12 - 24 weeks	8 - 16 weeks	12-24 weeks

* Depends largely on cost of mold tooling ‹ Less than

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