An Introduction to Purchasing Castings

The basics of sand casting design and manufacturing

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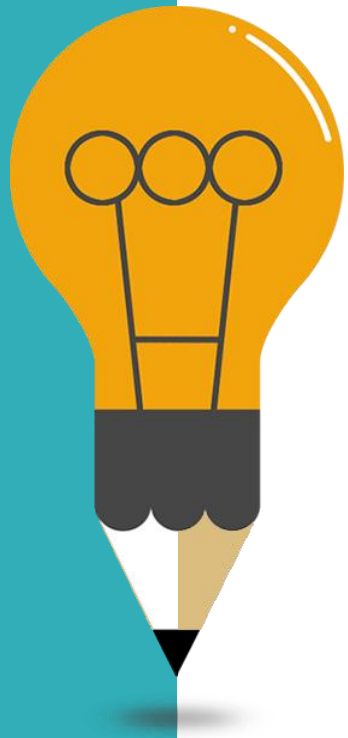
How Its Made



01

Design of Product

What are you making?

02

Design of Tooling

How are the molds going to be made?

03

Casting Process

How does the casting process work?

04

Finishing

How are parts finished?

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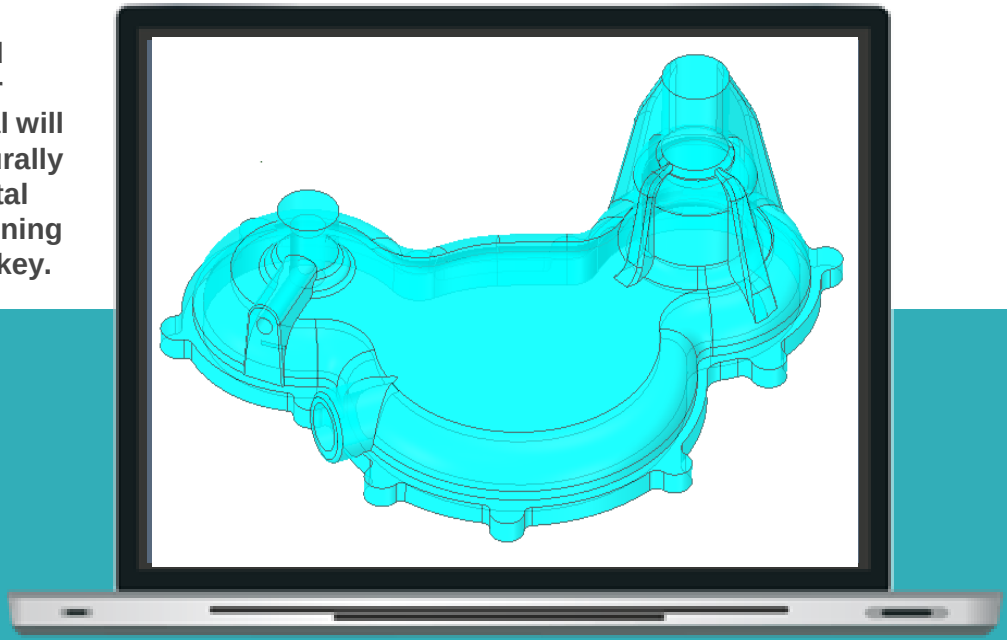
Design of Product

What are you making?

Once a concept or model has been developed, it is important to review the design with your foundry supplier. Casting limitations are best reviewed and remediated before the prototype is even made. For example: If outer walls are designed too thin, metal will freeze before filling the cavity. If are too thick, naturally occurring dimensional shrink will leave a void. Metal needs flat areas to flow into the castings. So designing flat locations on the outer areas of the castings is key.



Additionally material selection is critical. While some materials like A206 aluminum appear to have the best properties, the castability and risk for defects is high. Alloys like A356 provide sounder castings while still providing formidable strength.

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Design of Tooling

Tooling is required for all castings. Depending on whether the product has been modeled, how many castings you will require, and how quickly you will require them, there are a variety of choices available – each with their own purpose.

Low Volume (1-10 castings) → **High Volume (10-1000 castings)**

3D printed

$100-$1000

Rapid Prototyping

Styrofoam

$100-$1000

Fast, Cost Effective

Wood

$500-$5000

Cost Effective

REN

$1000-$20,000

High Volume

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Product of Tooling & Quality

Each particular style of tooling will yield a unique finish. For parts where appearance is not critical, or a prototype is needed quickly, 3D printed and styrofoam castings are good selections. Where appearance affects function, consider wood or REN (plastic) patterns.

Coarse Finish → **Smooth Finish**

3D printed

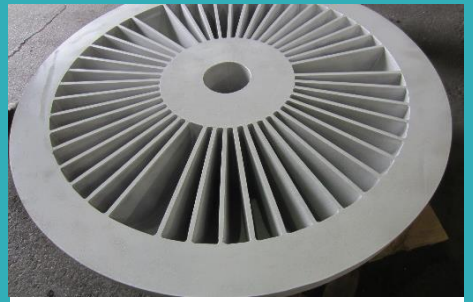
Roughest

Complex

Styrofoam

Rough

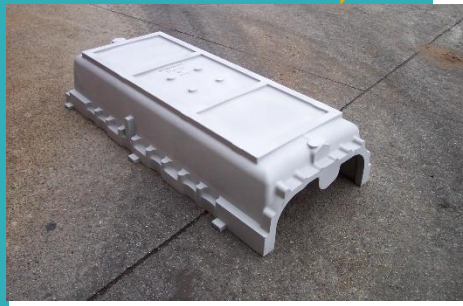
Simple



Wood

Smooth

Simple and Complex



REN

Smoothest

Complex

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Casting Process

How the does casting process work?

Molding

With the pattern, sand is formed and cured to develop the cavities for the metal to flow.

Melting

There are a wide variety of materials available each with they own specific properties and melting temperatures.

Pouring

Temperature and speed of the flowing liquid metal is critical in yielding a sound casting.

Shakeout

Once the metal has cooled, the casting is broken free from the sand mold.

Cutting

Gates and risers used to aid in solidification and moving liquid metal are removed.

Rough Finishing

Rough areas are polished down with grinding equipment and a final sand blast used to finish the casting.

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Finishing Processes

Depending on the finish and quality requirements, secondary processing may be required:

Radiographic Testing

X-rays would be used to verify the integrity of the casting

Penetrant Testing

Fluorescent liquids are used to verify there are no surface cracks

Machining

Removing material in specific areas to yield a final product

Heat Treatment

Fine tune final material properties through controlled metal heating and cooling

Hardness Testing

Simple way of testing the final strength of the material

Compositional Testing

A spectroscope is used to verify the material composition

Dimensional Inspection

A CMM or light scan is used verify the shape of the casting meets the print/model

Coating

Anodizing, plating, or painting depending on the final properties desired

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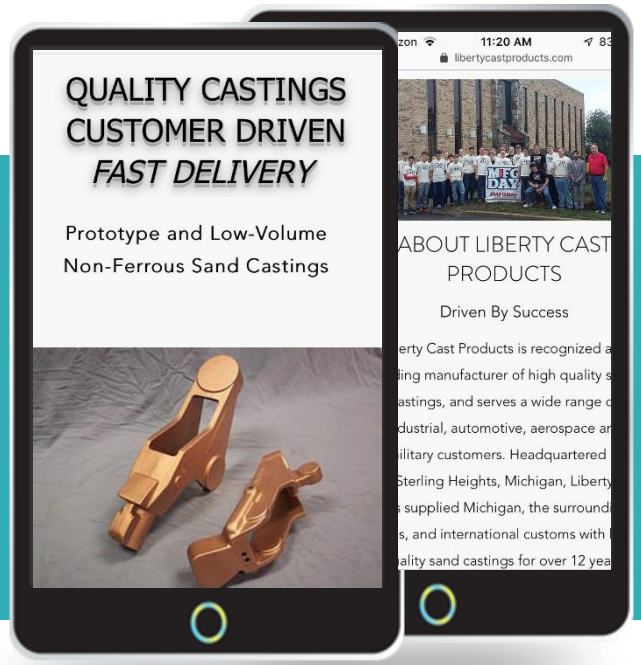
- **Aluminum**
- **Brass and bronze**
- **Fully machined castings**
- **Metallurgical support**
- **Porosity free melt-to-pour operation**
- **Reverse engineering**
- **3D-printed mold capability**



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