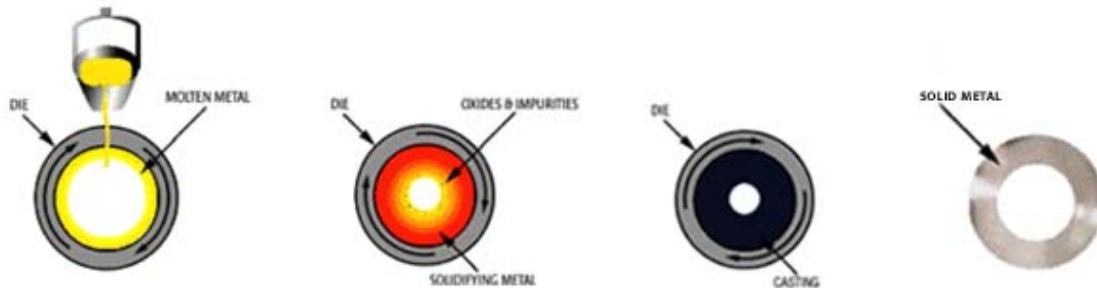


Centrifugal Casting

CENTRIFUGAL PROCESS



BENEFITS OF CENTRIFUGAL CASTING

Virtually Shrinkage Free

- Solidification occurs from the OD inward. Castings are designed to have the ID be the last metal to freeze. This effectively makes the ID the casting's "riser".
- Centrifugal force literally "squeezes" molten metal into shrinkage voids as they are formed.
- The resulting casting is thus very dense especially when compared to a static casting.

Secondary Refining

- Centrifugal force spins the more dense material (the metal) to the OD of the molten casting.
- The less dense material (the dirt, dross, or slag) spins preferentially to the bore.
- These non-metallics are removed in subsequent machining operations leaving a very clean, very dense end product.

TOP 5 BENEFITS OF CENTRIFUGALLY CAST HYDRAULIC CYLINDERS

1. **Integrally Cast Flanges**
2. **Quantity Flexibility**
3. **Delivery of Non-Standard Sizes**
4. **Alloy Flexibility**
5. **Availability of Heavy Wall Thickness**

1. Integrally Cast Flanges

The **centrifugal casting process** allows some shaping of the outer diameter of the workpiece. As long as the shaping is graduated in a manner that allows the part to be removed from the die, the **shape can be cast integrally**. This feature was an important factor in off-road truck manufacturers switching from welded construction to centrifugals. Typically, **large heavy walled cylinders are flanged** to accommodate the high pressures exhibited on the end seals. **Welded construction utilizes seamless**

BACKGROUND: For over a decade, Spuncast, Inc. has sold hydraulic cylinder components to heavy equipment original equipment manufacturers (OEMs) and suppliers. Applications have included:

- **Shock Absorber Cylinders, Stabilizers, and Dumper Cylinders** for off-road heavy-duty mining trucks
- **Shear and Crusher Cylinders** for demolition or recycling applications
- **Riser Tensioner Cylinders** for offshore oil platforms
- **Building Stabilizer Cylinders** for earthquake protection
- and many other uses.

The starting tubes used in the production of hydraulic cylinders can be produced by several processes. While hot milled tubing, forged tubing, rolled and welded tubing, even tubing machined from bar stock, can be used, many customers have found cost and value benefits by using centrifugal castings.

tubing or forged tubing (often economical when purchased in quantity) with a forged flange welded on one or both ends. The weld must be full penetration for safety reasons.

Subsequently, this assembly must then go through **post weld heat treatment** to achieve acceptable mechanical properties. An integrally cast flange from the centrifugal process will **achieve strengths in excess of four times (4X) that of the welded/heat treated equivalent**. For this reason alone, manufacturers have readily accepted centrifugal castings for their critical cylinder bodies.

2. Quantity Flexibility

While large regular runs are easily accommodated, centrifugal castings are particularly suited to smaller, job-specific runs. At Spuncast, seamless, DOM tubing, or tube mill manufacturing can be very economical when purchased in large quantities or "mill runs". Yet, because each centrifugally cast tube is usually an "individual" furnace heat, single piece or small quantities will not drastically change the cost.

3. Delivery of Non-Standard Sizes

The centrifugal casting process lends itself extremely well to non-standard sizes. The dies, while not inexpensive, are manageable both financially and in lead time. The dies shape and size only the outer diameter of the casting while the amount of molten metal poured sizes the inner diameter. When engineers design cylinders for a specific duty, there are many times when standard pipe sizes are not available in the required diameter or the desired wall thickness. Centrifugal castings are an excellent solution to this dilemma.

4. Alloy Flexibility

This is an outstanding benefit for using centrifugal castings in hydraulic cylinder applications. Through metallurgical control and a quench facility designed specifically for tubular parts, Spuncast is able to achieve extremely good and extremely repeatable mechanical properties from low alloy steels. This makes our tubes usable in many high pressure applications. It is also possible to pour high strength stainless alloys, such as 17-4PH, duplex stainless steels, or super duplex stainless steels. Spuncast has the metallurgical experience and expertise to pour each of these alloys.

5. Availability of Heavy Wall Thickness

Centrifugal casting facilitates the production of heavy walled cylinders. **Wall thicknesses of 30 mm to 65 mm** are possible and common. Other methods of manufacturing are either incapable of these dimensions or would be cost-prohibitive. Centrifugal casting offers an economical means to meet design requirements.

Summary:

There are **numerous processes used to produce Hydraulic Cylinder Bodies**. Each can be economically appropriate in specific situations. The benefits outlined above show that the centrifugal casting process should definitely be considered when designing and purchasing cylinder bodies. Spuncast Sales Engineers are available to help determine if centrifugal casting would be an economical option for a particular hydraulic application.