



FIERF

**Forging Industry Educational
and Research Foundation**

Forging Industry Frequently Asked Questions (FAQ)

What is forging?

Forging is a manufacturing process where metal is plastically deformed under great pressure into high-strength parts known as forgings. The process is normally (but now always) performed hot by preheating the metal to a desired temperature. It is important to note that the forging process is entirely different from the casting (or foundry) process, in which the metal used is melted, then poured or injected into a die.

Why use forgings and where are they used?

The forging process can create parts that are stronger than those manufactured by any other metal process. This is why forgings are almost always used when reliability and human safety are a concern. But you will rarely see forgings, as they are normally used as component parts used inside assembled items such as your car, airplanes, oil drilling equipment, engines, missiles and all kinds of capital equipment.

Who buys forgings?

Forged parts vary in size, shape and sophistication - from the hammer and wrench in our tool box, to close tolerance, precision components in commercial airplanes and the Space Shuttle. In fact, more than 1,800 forgings are contained in a Boeing 747. Industries that tend to be the largest buyers of forgings include: aerospace, defense, automotive, agricultural, construction, mining, material handling, and general industrial equipment manufacturers. Even the dies themselves that make forgings (as well as die cast and plastic parts) are themselves forged.

How big is the forging industry?

The forging industry is composed of those plants that:

- Make parts to order for customers (referred to as custom forgers)
- Make parts for their own company's internal use (referred to as captive forgers)

- Make standard parts for resale (referred to as catalog forgers)

The largest sector - custom forgers - accounts for more than \$4 billion in sales annually. These custom forgings are produced by 250 companies in about 300 plants in the U.S. and Canada.

How many people are employed by the forging industry?

About 40,000 people are employed by the forging industry in the U.S. and Canada. Because modern forging is capital intensive (requiring an abundance of heavy equipment and people to run and maintain it), most forging plants tend to employ between 50 and 500 people, with a few larger facilities employing more than 1,000 people.

What metals are forged?

Just about any metal can be forged. However, some of the more common metals include:

- Carbon, alloy and stainless steels
- Tool steels
- Aluminum
- Titanium
- Brass and copper
- High-temperature alloys which contain cobalt, nickel or molybdenum.

How many types of forging processes are there?

There are basically three methods (or process) to make a forged part:

- Impression die forging deforms metal between two dies that contain a precut profile of the desired part. Parts from ounces to 60,000 lbs. Can be made using this process. Some of the small parts are actually forged cold.
- Open-die forging is performed between flat dies with no precut profile. Larger parts up to 200,000 lbs. and 80 feet in length can be hammered or pressed into shape this way.
- Seamless rolled ring forging is typically performed by punching a hole in a round piece of metal (creating a donut shape) and then rolling and squeezing (or in some cases, pounding) the donut into a thin ring. Ring diameters can be anywhere from a few inches to 30 feet.

What kind of equipment is used to make forgings?

Although styles and drive systems vary widely, a forging can be produced on any of the following pieces of equipment:

- Hammers deform the metal into shape with controlled high-impact blows.
- Presses squeeze the metal into shape with controlled high pressure.
- Upsetters are basically forging presses used horizontally for a forging process known as "upsetting."
- Ring rollers produce a seamless rolled ring.

