FORGING 101

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What is Forging?

A MANUFACTURING PROCESS WHERE METAL IS PRESSED, POUNDED, OR SQUEEZED UNDER GREAT PRESSURE INTO HIGH STRENGTH PARTS KNOWN AS “FORGINGS.”

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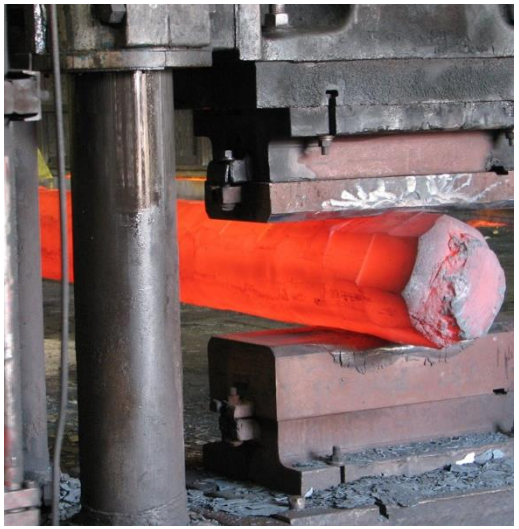
What is Forging? (Continued…)

- Forging is a bulk forming process where metal is deformed into shaped components.
- It can be performed cold, warm, or hot.
  - With warm and hot forging, there is a required preheating operation.
- Input material can be an ingot, billet, bar, wire, or a preformed shape.
- Forging is a solid-state process. This is unlike casting, where the metal is melted and poured into a mold.
- It is also a constant volume process (unlike welding or machining).



Forging Basics

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Forgings are used in many different industries…

- Aerospace
- Automotive
- Energy
- Defense
- Off-Highway
- Power Generation
- Gears
- Medical Equipment
- Hand Tools

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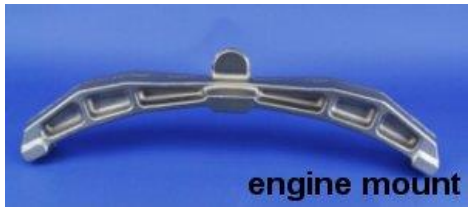
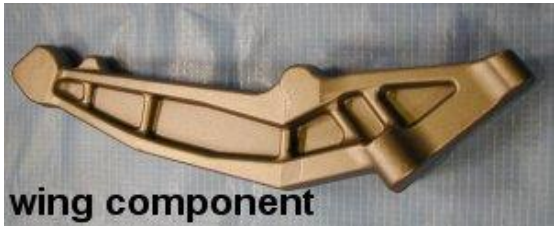
Aerospace

Landing Gear

Fan Blades





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Automotive

Suspension Components, Transmission Gears, Steering Arms, Pinion Gears, and Crankshafts

Wheels

Axle Shaft

Fasteners, etc.

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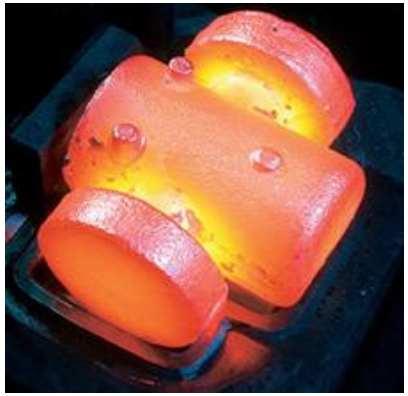
Energy



Valve Body

Valves

Fittings

Impellers

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Defense

Tank & bomb components & ammunitions

Off-Highway

Equalizer Bar

Main Shaft

Axles

Power Generation

Turbine Blades

Bearing Housings

Connecting Rod

Turbine Assembly

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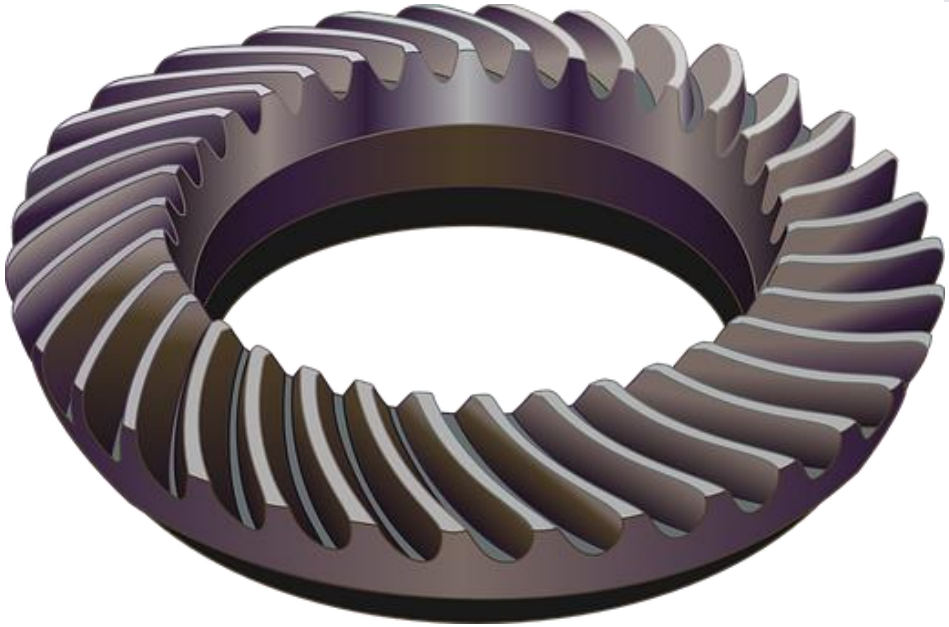
Gears



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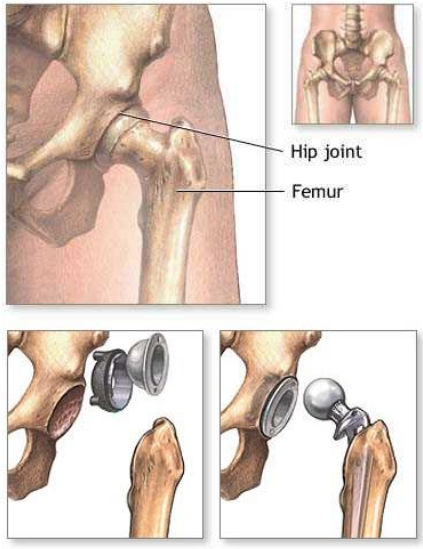
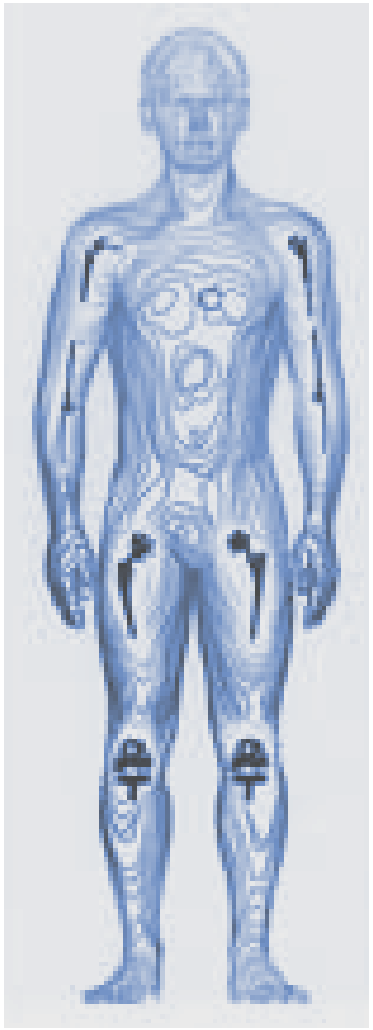
Medical





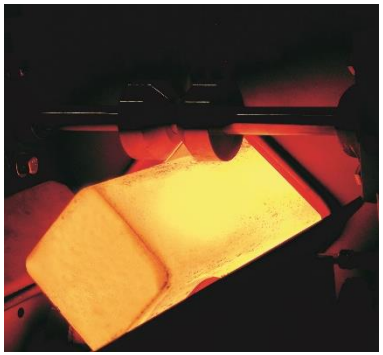
Implants

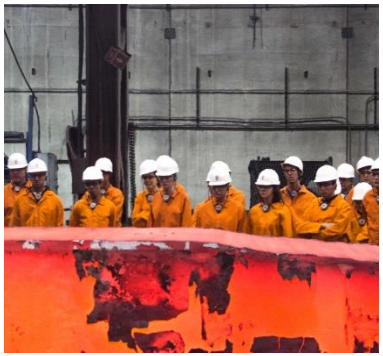
Pins & Screws

Hand Tools

Miscellaneous

Why are forgings important





Forged parts are strong and reliable, and therefore vital in safety critical applications. Rarely seen by consumers, forgings are normally component parts inside of assemblies. If it moves on land, in the air, or on the sea, it contains forgings.

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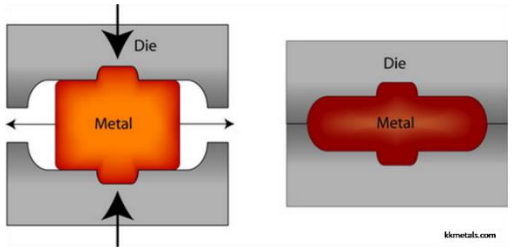
Processes & Materials

How are forgings made? Let's find out... →

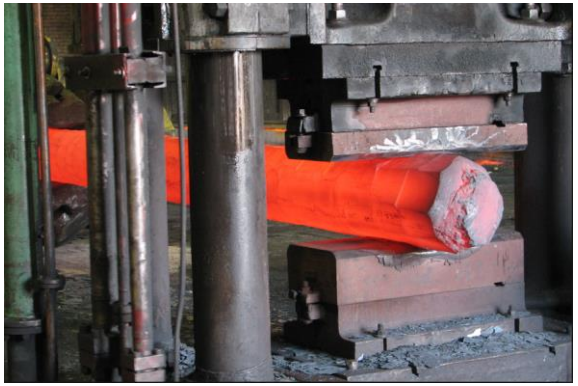
Forging Processes

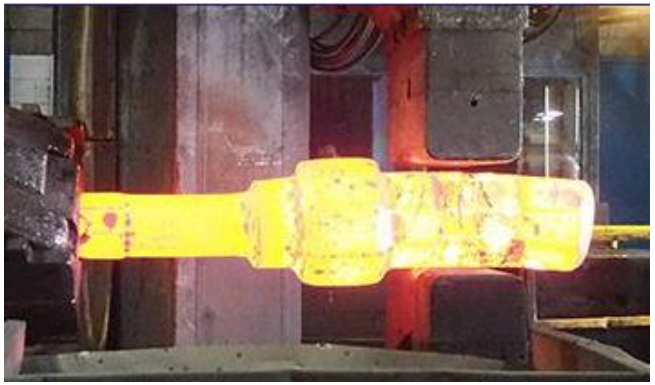
- Open Die
- Closed Die
- Ring Rolling



Open Die Forging

Open Die forging is the process of deforming a piece of metal between multiple dies on a press that does not completely enclose the material. The metal is altered as the dies “presses” the material through a series of movements until the desired shape is achieved. Open Die forging is often used for short runs of parts that are simple in design; such as discs, rings, sleeves, cylinders, blocks, and shafts.





Open Die Forging

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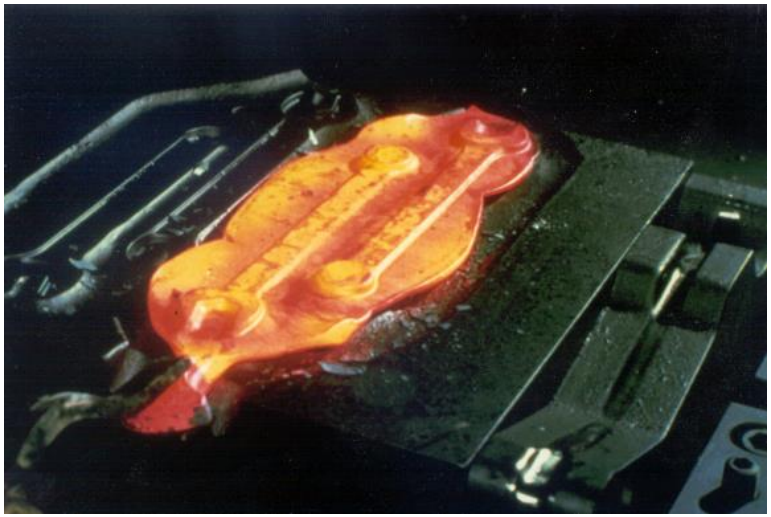
Closed Die / Impression Forging

Closed Die forging (also referred to as an impression die forging) is a metal deformation process that uses pressure to compress a piece of metal to fill an enclosed die impression. In some closed die forging processes, a succession of impression dies are used to modify the shape of the material into the final desired shape and form. Examples of equipment used to create these shapes are hammers, presses, up-setters, and impactors.



Impression Die Forging

This hammer forging video shows a typical steel forging process.
Multiple hits (forging operations) in multiple die cavities are common.

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Ring Rolling

Ring rolling is a particular category of metal rolling, in which a ring of smaller diameter is rolled into a precise ring of larger diameter and a reduced cross section. This is accomplished by the use of two rollers, one driven and one idle, acting on either side of the ring's cross section. Edging rollers are typically used during industrial metal rolling manufacture, to ensure that the part will maintain a constant width throughout the forming operation. The work will essentially retain the same volume, therefore the geometric reduction in thickness will be compensated for entirely by an increase in the ring's diameter. Rings manufactured by ring rolling are seamless. This forming process can be used to manufacture not only flat rings, but rings of differently shaped cross sections as well, producing very precise parts with little waste of material.

https://thelibraryofmanufacturing.com/ring_rolling.html

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Ring Rolling

Materials

Ferrous Metals

- Steel
- Carbon Steel
- Alloy Steel
- Cast Iron
- Wrought Iron

Non-Ferrous Metals

- Aluminum
- Copper
- Lead
- Zinc
- Tin

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So what kind of jobs are there in the forging industry?

- Process Engineer
- Forge Operator
- Sales & Account Manager
- Quality Assurance
- Manufacturing Engineer
- Materials Engineer
- Welder/Fabricator
- Electrical Engineer
- Technician
- Software Engineer
- CAD Designer
- Hammer Operator
- CNC Machinist
- Mechatronics Technicians
- Technical Product Designers
- Industrial Engineer
- Product Engineer
- Tool Production Manager

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Thank you!

Questions?