

## Wheel 101 - Wheel Materials

Modern metal wheels are typically produced from either steel or aluminum. Steel is not nearly as strong as aluminum, but also costs less.

Aluminum wheels are often called “alloy wheels” because rather than pure aluminum, they consist of a number of elements that when combined, form a product that we call aluminum. Aluminum wheels are lighter than steel wheels and as such provide benefits for performance, speed, and gas mileage. Aluminum wheels are what are most frequently used on the vehicles most of us drive.

Steel wheels are, of course, made from steel. This means they are sturdier, more durable, and typically easier to repair than aluminum wheels. On the flip side, steel wheels are also heavier, which adds to the weight of the vehicle and therefore reduces performance, speed, and gas mileage. This tradeoff is typically acceptable for more heavy duty applications, such as heavy machinery and large trucks.

## Wheel Manufacturing

In addition to the materials from which they are made, the way wheels are manufactured also impacts their characteristics and suitability for different uses, as well as cost.

Aluminum wheels are generally manufactured in one of four ways:

### Cast Wheels

The process of casting involves pouring liquid metal into a wheel-shaped mold and then allowing that metal to cool to a solid. Cast wheels are simpler to make, which reduces their overall cost, however, because the casting process often leaves small air pockets in the metal, these wheels tend to be weaker. Additionally, cast aluminum does not have a grain structure, which reduces the strength of the wheel compared to forged wheels.

### Flow Formed Wheels

A flow formed wheel starts its life as a casting. This cast wheel preform is then placed on a spinning machine where the barrel or rim section of the wheel is formed. The resulting wheel is stronger and a little lighter than a cast wheel but still lacks the properties and resulting strength of a forged wheel.





### Conventionally Forged Wheels

Conventionally forged wheels involve starting with a solid piece of metal and then heating it up before forming it into the desired shape with a conventional forging press. Conventionally forged wheels have no control in grain flow, hence, are stronger and lighter than cast wheels, but not as strong and light as rotary forged wheels.

### Rotary Forged Wheels

Rotary forged wheels are manufactured much like conventionally forged wheels, with the addition of the material being rotated at high speed (rotary) during the forging process. Rotary forging alters the molecular structure of the metal and gives manufactures better control over grain structure. It also allows wheels to be created with less material (thereby reducing weight) without sacrificing strength. Rotary forged wheels are really the top of the line option. They are the most

expensive but also the highest-performance manufactured aluminum wheels on the market.

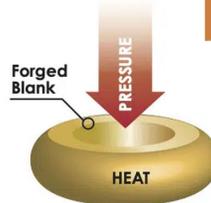
## WHEEL FORGING PROCESS

A look at how they're made explains why forged wheels are the go-to choice for racing professionals. Here's a simplified version:

**1** Starts with a solid chunk of metal. Unlike cast or flow formed wheels (which start with a cast wheel), fully forged wheels start out with a solid piece of aluminum billet.



**2** Apply pressure. To form the metal into a wheel requires intense pressure to "forge" the metal into a wheel. The billet is forged, using heat and pressure into a disc.



**3** Add the finishing touches. The disc is then flow formed in a spun blank.



**4** The spun blank is heat treated to T6 condition.

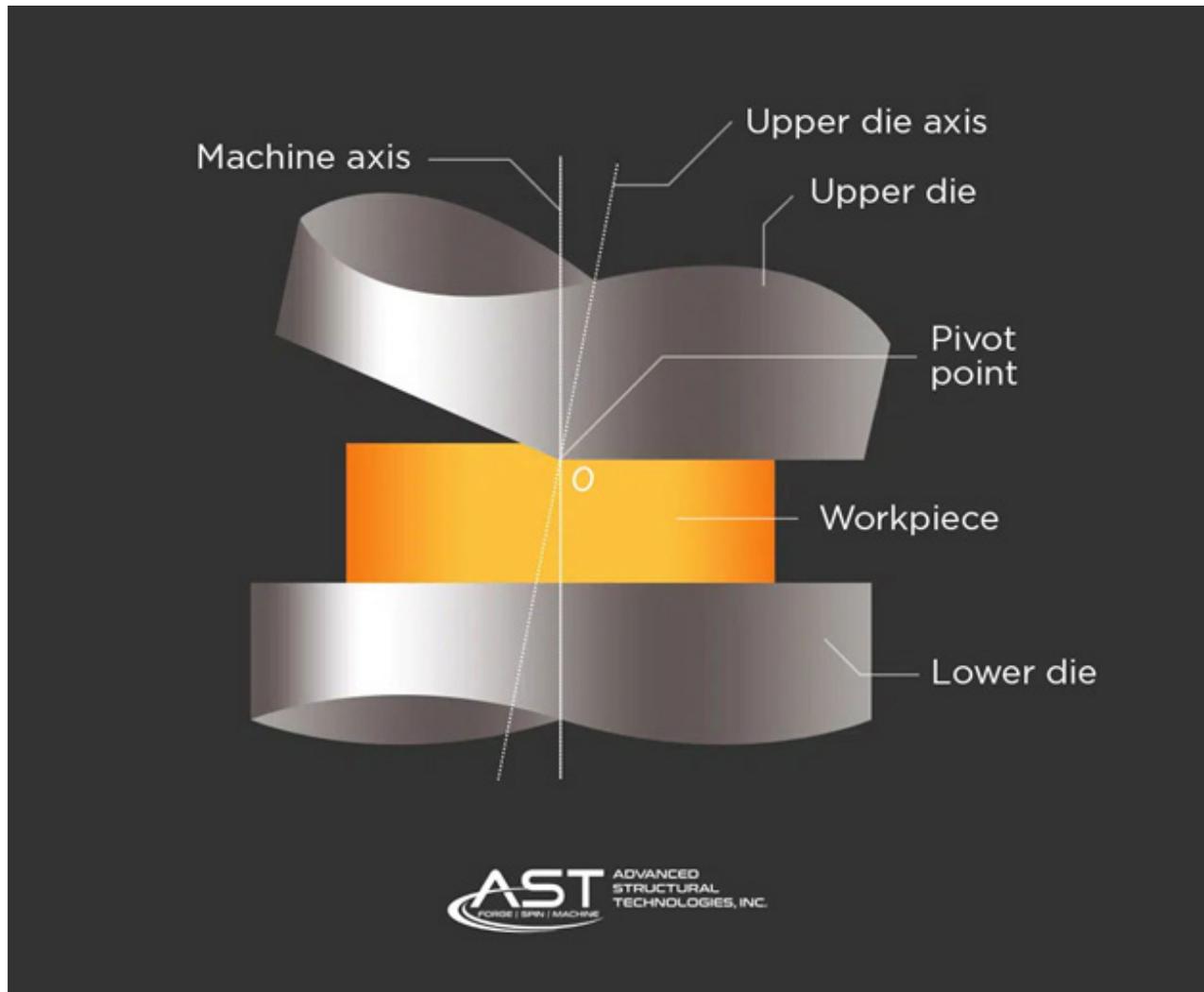


**5** The heat treated spun blank is then lathe turned to the customer's final configuration.



## Why Are Rotary Forged Wheels Superior to Cast Wheels?

We've established that cast wheels can be manufactured relatively cheaply, while rotary forged wheels – which involve far more advanced machinery and technology – are relatively expensive. So, why would anyone opt for a rotary forged wheel over a cast wheel?



Hopefully readers will have already guessed from the previous discussion that it is really a matter of quality, durability, and performance. Rotary wheels can be made lighter and thinner than cast wheels. This translates into better fuel efficiency and better handling.

Most consumers do not really need the added benefits of a rotary forged wheel. Cast wheels will get drivers where they need to go. But for those in need of high performance and durability, there is really no substitute for rotary forged aluminum wheels. The quality absolutely justifies the added cost for those applications.

## Choosing a Rotary Forged Wheel Manufacturer

In virtually any industry, the more advanced, the higher the performance, and the more specialized a product, the more differentiation there is between manufacturers. For example, producers of pure sugar end up with a commodity that's essentially indistinguishable regardless of who produces it. Sugar producers compete based on efficiency and scale in an attempt to be the low-cost leader. Providers of luxury watches, on the other hand, compete on quality, and there is a wide range of quality between top luxury watches and \$15 brands available at department stores.

Rotary forged wheels are a highly specialized product, and, as one would expect, there is a wide range of quality and performance depending on which company is selected as the manufacturer.

AST is proud to stand out as a leader among its competitors. AST offers unmatched design flexibility, such as AST's modular tooling approach, and our ability to easily offer different designs, offsets, and widths.

AST is also able to offer customers limited run components with a fast turnaround thanks to our ability to set up for short runs and flexibility on scheduling. These factors also provide AST the ability to control costs and scheduling.

In addition, AST offers the largest range of forged wheel centers in the world, with sizes ranging from 10" all the way up to 30" in diameter.

Despite all these high-quality differentiators, AST continues to offer competitive pricing relative to the competition.

