

# Alloy Wheels:



## What Makes Them Different?

Your customers may come to you for advice concerning the purchase of alloy wheels and performance tires for their Subaru vehicles. While selecting the proper diameter, width, offset and bolt pattern for the vehicle are all very important decisions, the actual wheel manufacturing method must also be considered. Several alloy wheel manufacturing methods are in use today. The following is a brief overview, describing the benefits or drawbacks derived from the wheel manufacturing processes that are currently in use.

### **Casting Versus Forging or Semi-Solid Forging**

Cast wheels are made from molten or liquid alloys. Forged or semi-solid forged (SSF) wheels are produced from a billet or solid alloy. Cast wheels may suffer from porosity problems (small

bubbles or pockets of air in the material). Gravity casting, low pressure casting, counter pressure casting and high counter pressure molding (HCM) are examples of production methods that are used to manufacture cast wheels. The difference between these methods is the amount of pressure that is used. Gravity casting uses only the force of gravity to fill the mold. Low pressure casting uses about 14 lbs. per square inch, counter pressure jumps to over 60 lbs. per square inch and HCM is over 120 lbs. per square inch.

Higher pressure helps reduce porosity and increase the quality and consistency of the finished product. Some alloys are heat-treated and some are not, which further changes the mechanical properties of the finished product. Casting wheels properly is a combination of art and science under extreme

control.

Forged wheels are made from a solid billet of material and are more consistent than cast products. Traditional forged wheels are manufactured using 8 to 14 million pounds of pressure and very expensive tooling. The basic forging is then spun to create the full width and shape of the rim.

Semi-solid forging (SSF) is more like a high-pressure injection process than a traditional forging process. A heated billet of aluminum alloy (A357), developed specifically for this process, is shot into a wheel mold at a very high rate of speed. The part is then heat treated to T6. After machining, the wheel is shot blasted. This step reduces internal stress, and increases the life and strength of the finished product.

The end result of SSF is a wheel with excellent properties,

more design flexibility than a traditional forged wheel, without the very high tooling costs.

#### **Points to Remember:**

When good engineering, testing and quality control are employed, cast wheels can be a very good product.

Forged wheels are usually produced in a facility that employs a very high level of engineering and rigorous testing. The results are a light and strong product. There is, however, a higher cost for this technology.

#### **Flow Formed or Rim Rolling Technology for Cast Wheels**

This specialized process typically begins with a low-pressure type of casting and uses a special high pressure spinning machine to form the rim. As the heated casting spins, steel rollers press

against the rim area to pull the rim to its final width and shape. The combination of heat, pressure and spinning actually changes the grain structure of the aluminum alloy and creates a rim area with strength that is similar to a forged wheel, without the high cost of forging. Some of the special wheels supplied to original equipment manufacturers (OEMs) for their high performance or limited production vehicles utilize this type of technology, which provides a light and strong wheel at a very reasonable cost.

The technical side of wheel applications is a non-stop activity. New vehicles and new high tech features are constantly being introduced to the market. *The End Wrench* would like to thank The Tire Rack for providing the information about alloy wheel production methods contained in