TECHNICAL NOTE 8.0 (Rev.A)

Cast Aluminum Hats vs. ***Forged*** Aluminum Hats

Background

"Casting" is the process of pouring molten metal into a mold to form a part.

"Forging" is the process of heating a solid piece of metal and applying massive pressure to press or hammer the solid ingot to form a part.

"Heat Treating" is the process of carefully controlled re-heating and cooling of a finished part, to remove significant stress points in the internal microstructure of the part and to change/improve the hardness and elasticity of the part.

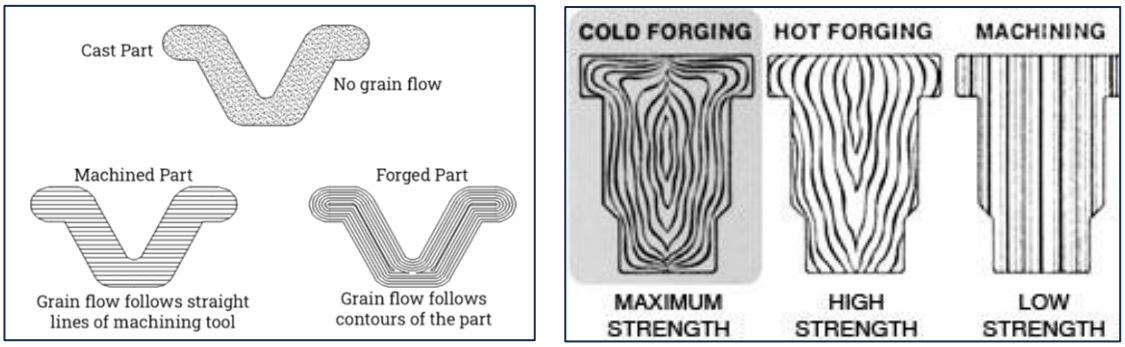
Whether "cast" or "forged", the resultant part may *look* similar, but the similarity stops there. The internal crystalline microstructure (referred to as the "grain" structure) of both parts is vastly different. The casted part is much weaker than its forged cousin.

The *casting* process creates a grain structure which is typically large, ununiform and often has many inclusions of microscopic air gaps, cracks and localized impurities that lower the structural integrity of the part. Further still, the uncontrolled cooling process can lead to poorly dispersed elemental additives (alloys) that were added to impart specific properties to the part (eg; the addition of Chromium to prevent corrosion).

The *forging* process literally forced this grain structure into a more uniform and compact geometry. The massive forces applied squeezes-out any microscopic air gaps and cracks and better disperses any impurities and additives. Finally, the immense pressures force the grain microstructure to follow the contours of the part in a flowing manner, creating a much stronger lattice arrangement and removes stress points prone to failure. Forging a part is a much higher cost process than casting a part, as it typically requires multiple, massive presses (rated in thousands of tons).

Heat Treating is often performed on both cast and forged parts, to further enhance their physical strength and other desired properties.

Figure 1: Grain Structure Differences: Cast vs Forged.



Cast vs. Forged Aluminum

You have likely heard of "forged aluminum wheels". You know that they are lighter and more expensive – but why?

They are lighter because they are made thinner, yet have the same or better strength than cast aluminum wheels, for all the reasons noted above. They are costly, because the forging presses used in their manufacture cost millions of dollars and there are usually several required.

PBS Cast vs. Forged Aluminum Hats

The aluminum hats employed on our Madhatter™ 2-piece floating iron rotors are *cast and heat treated*. This process gives the desired structural properties required for stresses anticipated.

The aluminum hats employed on our Canadian Carbon Ceramic™ 2-piece floating CCB rotors are *forged and heat treated*. This process creates a lighter hat, yet still gives the increased structural properties required for the stresses anticipated.

In both cases above, PBS utilizes Aerospace Grade 7075-T6 aluminum, which offers superior strength and rigidity than the more commonly utilized Grade 6061-T6 for aluminum hats. Please refer to TECHNICAL NOTE 3.0 for additional information.

To learn more about forging from an industry leader, visit http://www.canforge.com.