This is why we forge - Forgings vs. Castings

3 Reasons to Consider Forgings

1. Superior mechanical properties
   By working the cast structure sufficiently, it is possible to more than double the strength and toughness of the material. Only Copper Alloys has developed the technology required to suitably penetrate the full section of some of the most advanced forged alloys available:
   - Cast copper-nickel-chrome - 240 MPa 0.2% Proof Strength in actual castings
   - Wrought copper-nickel-chrome - 650-750 MPa 0.2% Proof Strength (+290%)

2. Reliable production processes
   Metal production commences with casting, and just casting metal can leave numerous metallurgical issues that unless dealt with, will only be known when the metal is being finish machined. The production of high integrity forgings puts the cast metal through its paces, indeed billets are likely to break-up when they are structurally deformed during the forging process if they contain significant defects. Any minor defects in the cast structure, which are normally the result of gas in the melt get closed up during the reduction of cross-section as a result of forging.

3. Ease of testing
   The ability to easily test material throughout the production process and prior to spending money and time machining it is a distinct advantage forgings have over castings. The refined grain structure of forgings enable them to be penetrated easily by ultrasonic techniques which results in forgings being able to be tested at a fraction of the cost as castings, which require much more costly radiographic examination. Also, by using multi-directional ultrasonic scans, fine defects can be detected, which would be missed by radiography. Finally, as ultrasonic examination can be carried out in-situ, wall-section checks can be much lower cost by avoiding the cost of equipment for corrosion inspection. With castings, it is regularly deemed more cost effective to just replace components rather than radiographic examination.

3 Benefits of Forgings

1. Quicker & on-time delivery; risk of non-delivery reduced
2. High integrity - actual material properties are reported
3. Enhanced resistance to corrosion and general performance

3 Limitations of Castings

1. Actual component properties are unknown as reported properties come from separately cast test piece
2. Prone to metallurgical defects
3. No efficient method of volumetric inspection

2 Myths about Forgings

1. Forgings are more expensive
   Due to the reliability of the production process, zero tooling costs and scalability of production, components made from forgings can be lower cost
2. Complicated shapes have to be castings
   With modern CNC machining techniques, it is possible to machine surprisingly complicated components from solid blocks of forged material. A good example is this nickel-aluminium bronze forging, that was machined from solid. Previously it was two castings welded together.