

Advantages of Cold Forging vs. Weldments and other Fabrication Processes

This Tech Bulletin provides a comparison of Cold Forging vs. weldments and other fabrication processes. It is part of a series of Tech Bulletins on Cold Forging. For more information, you can also read the Cold Forging Overview Tech Bulletin.

How are Cold Forging and Weldments/Fabrication Processes Different?

Cold forging is a metalworking displacement process that forms the existing material into the desired shape in a single-pass process as compared with weldments and other fabrication methods, which typically involve several steps to create the parts by bringing together and joining various elements.

The following sections describe some of the key advantages of cold forging vs. weldments and other fabrication methods.



Faster and More Efficient Production Processes

Forging offers significant production efficiencies, material savings, quality and yield advantages. Weldment fabrications are inherently more expensive because of the multi-step processes, especially in high volume production runs.

For this reason, fabricated parts are a traditional source of forging conversions as production volume increases. Initial tooling costs for forging can be absorbed by production volume and material savings and forging's intrinsic production advantages, including lower labor costs, along with reduced scrap, rework and inspection costs.

Improved Strength, Quality and Reliability

Forgings are also inherently stronger because of the single-pass high-compression forging process. By definition, welded structures consist of multiple separate elements that are being joined together. Therefore, this approach also has multiple points of potential weakness and risk of failure, all of which must be carefully controlled. For example, welded points may exhibit porosity and may require additional inspection steps to assure proper strength. The integrity of the entire part can be compromised by any instance of poor welding or joining practices.

In contrast, the single-pass, high-compression process used in cold forging actually displaces and rearranges the grain of the base material such that any inherent weaknesses are eliminated, while at

the same time maintaining the integrity of the entire forged part. Since there are no separate elements being joined together, cold forging is able to yield a grain structure oriented to the entire part shape, resulting in optimum strength, ductility and resistance to impact and fatigue.

Simpler and More Effective Process if Net Shape Forging is Possible

From a design standpoint, parts that can be manufactured using Net Shape cold forging processes are more straightforward and present fewer challenges. Because there is only one forged part instead of multiple separate elements, the structural integrity is much easier to model and control.

A multiple-component welded assembly cannot match the simplicity, structural integrity and production cost-savings that can be achieved with a properly designed, one-piece forging.

Note that for cold forging to be applicable, the part geometry should be quite simple in the first place, at least simple enough to forge. In these cases, Net Shape Cold Forging can be significantly more effective than weldments. However, for more complex parts where post machining may be required then then you need to look at Total Process costs and tradeoffs.

Where applicable, cold forging offers more consistent, better metallurgical properties as compared with the selective heating and non-uniform cooling that can occur when welding separate elements together. Forgings have no internal voids that cause unexpected failure under stress or impact.

Summary

Compared with multi-element welded fabrication processes, cold forging is able to deliver significantly faster and more efficient production processes, lower costs of inspection or scrap, improved strength, simplified processes and higher quality products.

Other Cold Forging Tech Bulletins:

Tech Bulletins on other cold forging topics include:

- Overview of Cold Forging
- Comparison of Cold Forging to machining
- Comparison of Cold Forging to casting

More information regarding cold forging technologies can be found on the web by visiting <http://www.interplex.com/services/cold-forging>