

## *Advantages of Cold Forging vs. Machining*

This Tech Bulletin provides a comparison of Cold Forging vs. conventional machining 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 Machining Different?**

Cold forging is a displacement process that forms the existing material into the desired shape whereas conventional machining uses a removal process to take away material in order to create the desired shape. The following sections describe some of the key advantages of cold forging vs. machining.



### **Higher Productivity for High-volumes**

A primary reason that many companies move a process from machining to cold forging is the need for achieving higher throughput from the production line. In many cases, machining involves multiple-pass operations to remove material and to finish the part (e.g. vertical, horizontal, bulk removal, detail touch-up, etc.). In contrast, cold forging is typically a single-pass forming process that deforms the existing material into the desired shape.

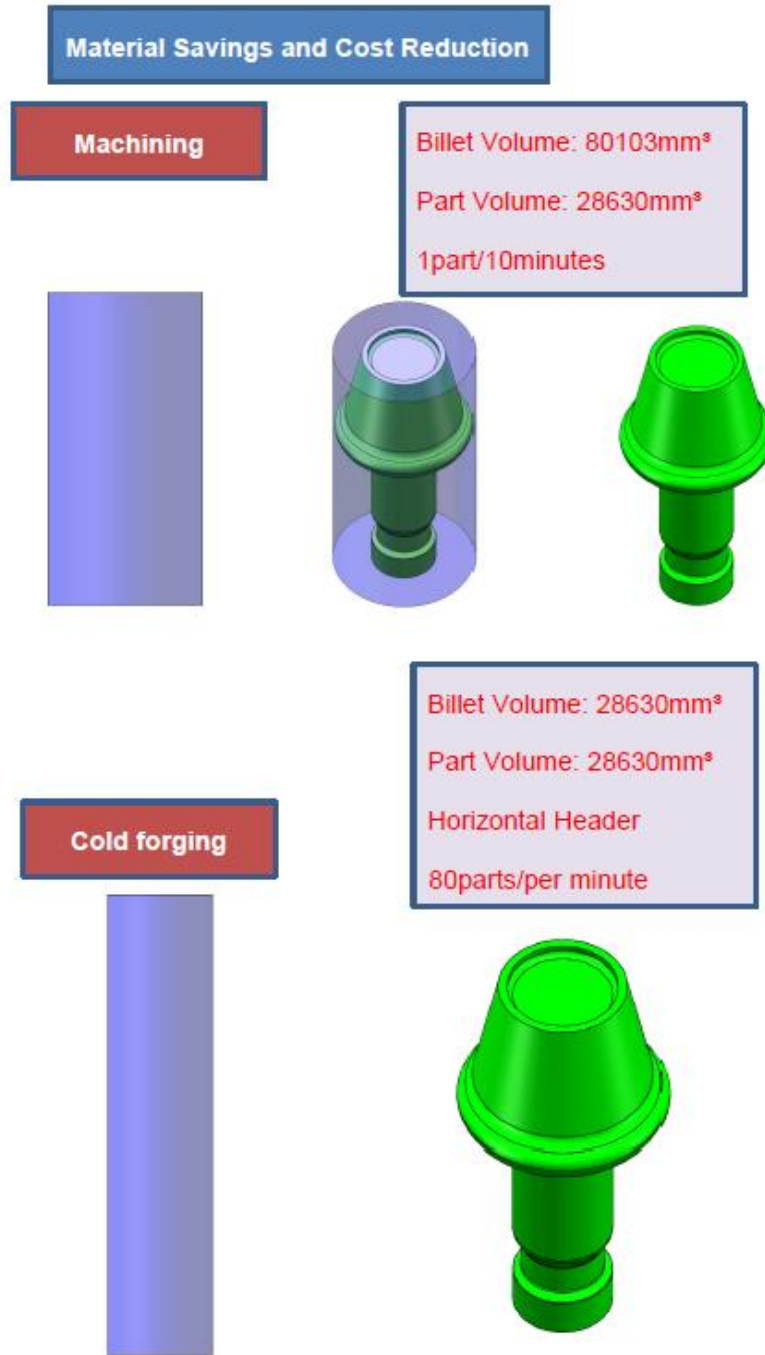
Depending on the specific part parameters, the time savings per piece can deliver major productivity advantages. For example, some parts that take 3 to 5 minutes per piece for machining have been converted to cold forging with throughput of over 50 parts per minute.

The opportunity to achieve 100 to 200 times productivity improvement offers fast ROI on the investment in cold forging die and tooling. Many companies have opted to use machining only for prototyping and early production phases for new parts, with a transition to cold forging planned into the higher volume production ramp-up.

## Material Savings and Cost Reduction

Another key advantage of cold forging is the elimination of wasted material, which is an inherent characteristic of all machining processes. Instead of removing a significant amount of the raw material, a cold forging process makes use of it all.

Forgings, especially near-net shapes, make better use of material and generate little scrap. In high-volume production runs, cold forging offers a decisive cost advantage, with better use of material and fewer secondary operations.



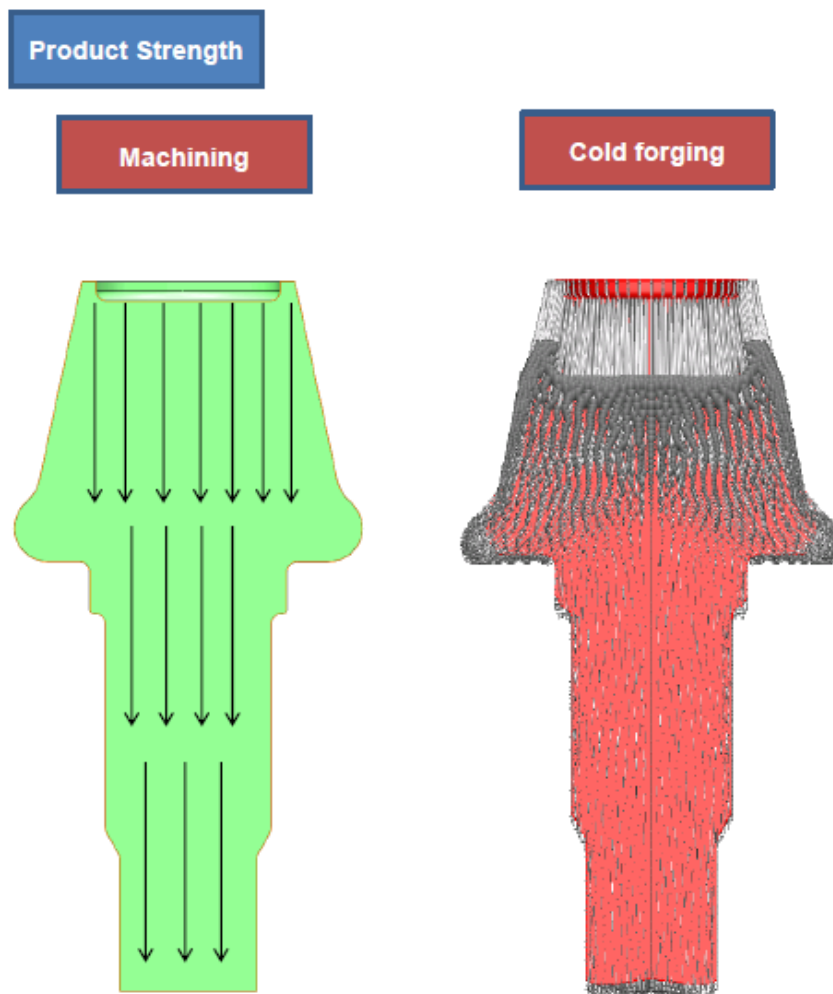
## Design Flexibility

Cold forging offers a broader range of material grades that can be used to create parts as compared with machining, where the sizes and shapes of products made from steel bar and plate are limited to the dimensions in which these materials are typically supplied. In some cases, cold forging may be the only metalworking process that can be used with certain shapes in desired sizes. For example, vertical cold forging can work shaped extruded billets, providing an advantage over machining which is usually limited to round bars, but range is constrained to comparatively softer materials.

## Product Strength

Cold forging enables the material grain to be oriented with the overall product shape for greater strength. Machined bar and plate may be more susceptible to fatigue and stress corrosion because machining cuts may not be optimally aligned with the material grain pattern. This can be particularly important for part designs where the required shape could experience weak points along the existing grain of the base material, such as long protrusions that cut across the grain or narrow points that could be prone to breakage under stress.

The high compression process used in cold forging actually displaces and rearranges the grain of the base material such that any inherent weaknesses are eliminated. Therefore, cold forging is able to yield a grain structure oriented to the part shape, resulting in optimum strength, ductility and resistance to impact and fatigue.



## Summary

In addition to the key advantages detailed in the previous sections, cold forging also offers other benefits such as:

- Better surface finishing on extruded surfaces versus machining, based on the same amount of forming time.
- Higher hardness on compressed surfaces versus machining which maintains same hardness of raw material.

Compared with conventional machining processes, cold forging is able to deliver higher productivity production results along with better and more cost-effective use of materials, while also providing design flexibility, improved quality and higher strength parts.

### Other Cold Forging Tech Bulletins:

Tech Bulletins on other cold forging topics include:

- Overview of Cold Forging
- Comparison of Cold Forging to casting
- Comparison of Cold Forging to weldments and fabrication methods

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