Interplex Cold Forging Tech Bulletin

Cold Forging: Achieving a Variety of Shapes and Design Flexibility

Near Net-Shape Outputs Enable Higher Production Rates and Lower Costs

This Tech Bulletin provides information on the range of different product designs that can be achieved using Cold Forging processes and how net-shape outputs can enhance production efficiency, improve product quality, increase manufacturing yields, and reduce product costs.

What is Cold Forging?

Cold Forging is an "impact forming" process that deforms a billet of raw material plastically, under high compressive force, between a punch and a die using a Horizontal or Vertical Cold Forging press.

The process is particularly helpful for creating complex shapes that are ready or near-ready for final usage after a single Cold Forging step, thereby avoiding the high costs, material waste and slow production outputs associated with multi-step processes such as machining or weldments.

This Tech Bulletin focuses specifically on the wide range of different shapes and applications that are achievable with Cold Forging processes. For a broader understanding of Cold Forging technology, please visit the Interplex website: Click here for more information on Cold Forging.

Figure 1 – Cold Forged Parts

Cold Forging Fundamentals

Cold Forging techniques include Extrusion, Coining, Upsetting, and Swaging. These techniques can take place in a single punch stroke Vertical operation, or in sequential succession through a series of dies in a Horizontal operation. The process, Vertical or Horizontal, depends on the specific application and complexity of the product produced.

The key advantages of Cold Forging are:

- Achievement of final or near-final net-shape output (minimize secondary operations)
- High-utilization of input materials (minimize wasted material)
- Improved product strength (minimize weak points) or
- Faster production cycles (maximize throughput volumes)

By efficiently forming all the existing material into the desired shape, Cold Forging minimizes waste, e.g. Volume-In (billet) = Volume-Out (product), and reduces or eliminates the need for secondary operations such as machining, surface finishing or welding together multiple parts. The combination of these benefits greatly increases production throughput rates, in some cases by as much as 100 times faster than other manufacturing methods.

Cold Forging processes can create parts that are stronger than those manufactured by any other metalworking technique. Therefore, Cold Forging has become the preferred process where reliability and human safety are critical. However, the resultant parts are rarely seen because they are typically contained inside assembled items such as airplanes, automobiles, tractors, ships, HVAC systems, oil drilling equipment, engines, missiles and all variety of capital equipment.

The following sections look specifically at some of the applications and products that can be achieved with Cold Forging near net-shape capabilities.

Automotive Drivetrain Components

Automotive drivetrain components must endure very high forces (torque, coupling, internal pressures, etc.) and handle instantaneous changes in force over the lifetime of the vehicle. Also, global competitive pressures are forcing companies to engineer and produce powertrain systems that are more economical to manufacture, higher in product quality and reliability, and have longer life expectancy. Cold Forging has already proven to be the ideal process for creating automotive drivetrain components.

For more information, read the Tech Bulletin on Cold Forged Drivetrain Parts.

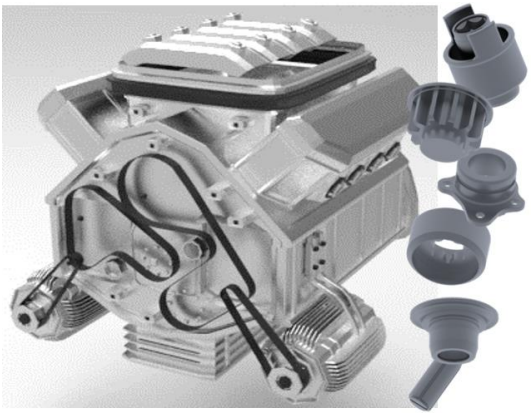

Figure 2 – Cold Forged Engine Parts

Figure 3 – Cold Forged Transmission Parts

Chassis, Braking and Suspension Components

In addition to drivetrain parts, automotive designers are increasingly turning to Cold Forging processes to create key components in vehicular chassis (Figure 4), braking (Figure 5) and suspension systems. These areas also require high strength and reliability for complex part designs that need to be produced in high volumes at competitive prices.

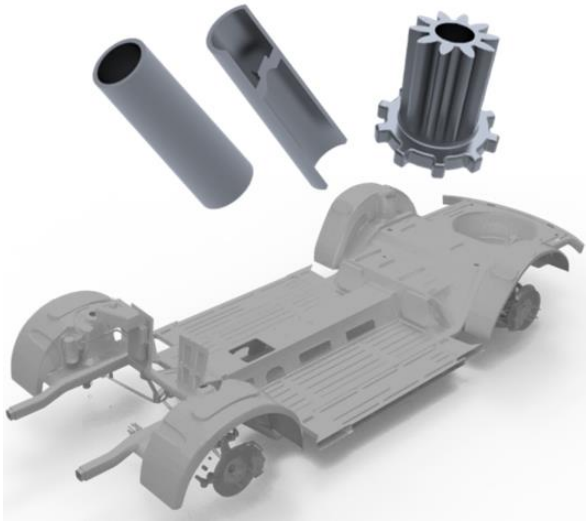

Figure 5 – Cold Forged Chassis Parts

Figure 4 – Cold Forged Brake Parts

Steering and Passenger Compartment Parts

Another area in which Cold Forging is very useful is the production of parts such as steering systems, seat mechanisms (Figure 6) and other components in automotive driver/passenger compartments. Here again, the strength and reliability issues are important for safety and performance but there is also a major benefit from the near net-shape results achievable with Cold Forging.

In particular, the ability to provide high-quality surface finishing for net-shape parts provides a significant savings on those components that may be visible to consumers. Although structural and strength issues are still critical, the appearance of these parts is almost as important because they will be seen by users and any surface blemishes or roughness may be considered as flaws.

The ability of Cold Forging to deliver net-shaped parts with excellent quality surface finishes right out of the die enables manufacturers to reduce overall costs by eliminating the need for secondary finishing operations.

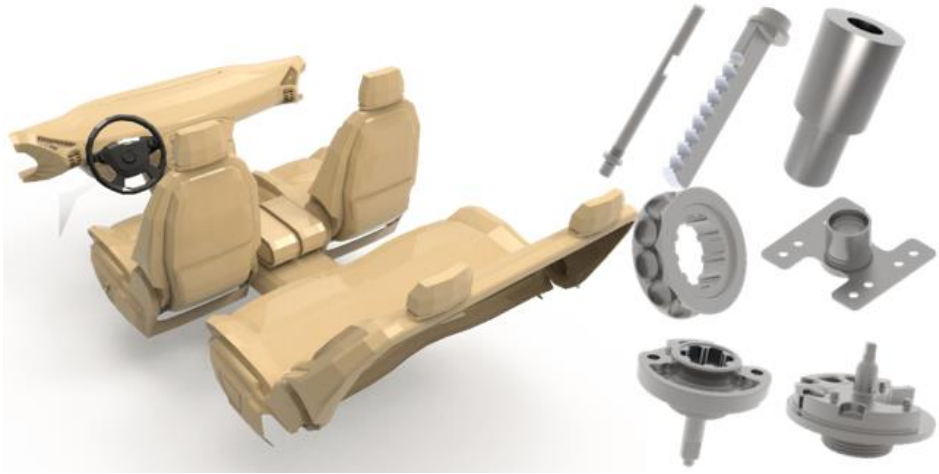

Figure 6 – Cold Forged Seat and Steering Parts

Industrial Equipment, HVAC, Network Enclosures, and other Structural Mechanisms

Although Cold Forging processes are already spreading throughout the automotive ecosystem and yielding excellent results, this success sometimes over-shadows the diverse and growing range of applications for Cold Forging in other industry segments. Cold Forging parts are helping streamline manufacturing and lower the costs for a variety of industrial and consumer applications that require high volumes, low costs, structural integrity and outstanding surface characteristics. For example, Cold Forging is an excellent alternative for producing complex structural mechanisms such as disc carriers or mass storage devices. It also can deliver low costs and high strength for structural components in network servers, computing systems and other industrial equipment.

Figure 7 – Cold Forged Parts

Keys to Success

As shown above, Cold Forging offers a great opportunity to convert multi-step processes on existing parts or to design new parts from the ground up to deliver savings on material, improved product strength, enhanced surface finish and more efficient high-volume production yields. The key to success with Cold Forging is to start early in the design process and to work with a partner that understands how to get the most out of real-world application of Cold Forging technologies.

Interplex's Cold Forging capabilities bring together many decades of engineering experience in advanced product design with the most advanced impact forming processes and production facilities. This gives each of our customers a best-fit to their unique requirements while improving product strength and lowering costs.

From the initial design concept by expert engineers in our state-of-the-art R&D center to full production ramp-up, Interplex has the capability to design not just a forged part, but a complete manufacturing process; providing the customer with a highly efficient turn-key solution to meet their needs.

For more information about Cold Forging, visit our website at https://www.interplex.com/forging or drop us an email at communications@interplex.com.