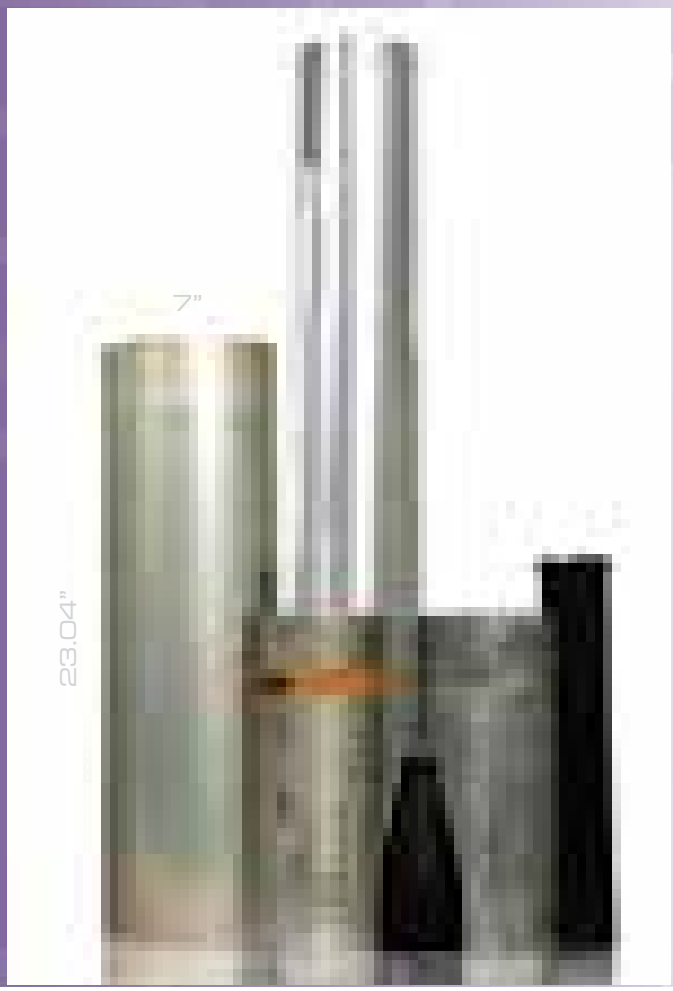
BUCKEYE shapeform

deep draw technology:

making high-quality mission-critical parts affordable to produce



Deep draw technology:
Making high-quality mission-critical parts affordable to produce

Some products simply cannot afford to fail. Ever. Like the breathing tanks used by firefighters and miners. The missiles deployed by our military. Or the brake system filter cases used by automobile manufactures. In applications where product performance is mission critical, commercial, military and aerospace companies need technology they can rely on to manufacture deep-drawn cylindrical product components that deliver superior product integrity and optimal performance results. Every time.

But the fact is, many conventional production alternatives—like impact, spinning and supplemental annealing—fall far short when it comes to producing some failsafe, mission-critical parts. These traditional processes cannot deliver consistently reliable results for certain applications. They often use more raw materials than product specifications require, adding to the overall cost and weight of products. And they can make assembly of finished products difficult.

In instances when product characteristics can mean the difference between success or failure—or even life or death—the imperfections inherent in traditional processes beg the need for a more advanced manufacturing alternative.

Reversing the process for better results

Deep draw technology originated as a practical option for manufacturing unique parts once considered too difficult or too costly to produce through conventional methods. Through a virtually flawless manufacturing process, deep draw technology creates complex small, medium and large cylindrical shells, tubes and other shapes requiring close tolerances.

Eliminating costly secondary manufacturing steps

The Buckeye Shapeform deep draw process is actually a reverse draw. On the primary draw, material is pulled or drawn through a ring, forming a cup-shaped cylinder with uniform wall thickness. The cylinder is simultaneously turned inside out, or reversed, thus combining two draws in one operation and saving steps and time. Ironing is also performed during the deep draw process, which allows sections of the material to be ironed down to different wall thicknesses.

Once the part is drawn or shaped, the forming process begins. The necking and expanding processes allow for the creation of multiple diameters in a single part. Diameters can either be expanded or reduced (necked) to create forms that more exactly match the product engineer's specifications.

The process results in seamless, one piece parts with multiple wall thickness and diameters created through minimal operations. This eliminates the need to spend time and money on assembling separate product components (which is

necessary with conventional processes) while also delivering significant product benefits:

- The multiple wall thicknesses give strength where it's needed while reducing the amount of material used in other areas of the product, eliminating the waste of raw materials and reducing the overall weight and cost of the product.
- The multiple diameters simplify the assembly and positioning of internal parts and O-rings.

Providing more reliable results than conventional production alternatives

In addition to the cost advantages, deep draw technology results in refined, highly calibrated products with tolerances in the thousandths—and the accuracy is repeatable via high-volume, high-speed manufacturing.

Because the process allows for multiple wall thickness and diameters in a single part, there is no need to weld or otherwise connect separate product components to achieve the appropriate product shape and dimensions. Thus, vulnerable interfaces in the final product are eliminated, resulting in a product that performs more reliably in the field—an especially significant advantage in mission-critical applications.

To further improve product quality, deep draw technology relies on a controlled movement process. Typically, when metal is shaped and formed, the material grains are scattered and the integrity of the material structure is compromised. However, the controlled movement process uses optimum speed to enhance the efficiency of the process while maximizing material grain alignment in the final product, translating into a higher quality product produced as quickly as possible.

The deep draw process also results in a better finish than specified by most product designers. With deep draw, the finish is typically 63 micro-inches or less, lending a smooth, mirror-like luster to the final part. Traditional processes must employ secondary operations to achieve the same quality finish. In addition to the aesthetic advantages, the quality finish allows for the direct application of sealing aspects such as O-rings and gaskets during final product assembly, further eliminating secondary operations and providing an excellent, leak-proof seal that stands up to harsh field conditions.

The 'material' benefits of deep draw technology

Deep draw technology primarily utilizes aluminum of different alloys, however, the process also works well with copper, brass, mild (cold rolled) steel, precious metals and ductile metal.

While steel may make sense for some applications, the use of aluminum in the deep draw process provides significant advantages in the final product. Aluminum is softer and more malleable, making it easier to iron the material down and create multiple wall thickness and diameters.

Aluminum provides a uniform grain structure and strong, yet ductile product, compared to the less-uniform quality and brittleness of impact-produced parts. As a result, aluminum deep drawn products absorb vibrations better, which is critical with sensitive electronics and other technology.

A pound of aluminum delivers three times the effective material yield of a pound of steel. Furthermore, fluctuating prices and tariffs for steel make aluminum an attractive alternative in today's market.

Putting the 'deep' in deep draw

At Buckeye Shapeform, our metal forming experts and engineers have helped clients take advantage of deep draw technology since 1970. We continually refine our deep draw processes to deliver optimum results. While our competitors draw cylinders that are four inches in diameter and five inches long and call it deep draw, Buckeye's technology is capable of drawing components 20:1 length-to-diameter ratio!

Our deep draw technology is ideal for helping design engineers solve specific challenges and the process has been used to efficiently and economically produce unique parts for many demanding applications.

These real-world examples illustrate the many benefits of the Buckeye Shapeform deep draw process:

Hellfire Missiles
The Hellfire missile is the most accurate and successful long-range anti-armor weapon ever produced. The skin for the missile was originally conceived as a two-part unit requiring welding and assembly. Using our deep draw technology, Buckeye Shapeform's engineers designed a single-piece part with multiple wall thicknesses to replace the original design concept, eliminating the need for time consuming welds and weld inspection. In addition to saving time and money, Buckeye's design was far superior to the original concept, and the superiority and effectivity of the missile has been well-document in Operation Desert Storm.

High-Pressure Air Tank Liners
Buckeye Shapeform deep draw technology is used to produce liners for self-contained breathing apparatuses used in fire fighting and mine safety units. The aluminum liners must withstand an even distribution of pressure with no weak spots. The ability to create varying wall thicknesses allows the liners to meet Department of Transportation (DOT) requirements: they are strong enough to withstand test pressures of 10,000 PSI, yet light enough to be carried easily.

High-Pressure CNG Containers
Deep draw technology allows Buckeye Shapeform to produce CNG liners for use with buses, vans and light trucks. The final products meet DOT specifications but are lighter and less expensive than CNG containers made of steel or other materials. The deep draw process also eliminates secondary operations—only one end of the container requires spinning.

Going deeper to deliver single-source reliability

Buckeye Shapeform's deep-draw technology allows design engineers to create precision drawn, mission-critical metal parts that can be produced economically and with repeatable accuracy. Beyond the benefits of deep draw, Buckeye offers a complete range of value-added operations and capabilities to provide a final part produced to your every specification. Services include:

- Rotary trimming for cut-to-length cylindrical tubes
- Dimpling for inserting a recess similar to a counter bore to hide heads of screws
- Piercing for punching hole patterns in the walls
- Machining/turning for circle-milling hole patterns and/or lathe turning diameters and special features
- Environmentally sound sonic cleaning for producing highly-finished, attractive parts
- Tests and certifications for complying with all types of automotive, industrial and military statistical documented quality programs

To find out more about how deep draw technology and Buckeye's comprehensive capabilities can affordably and efficiently deliver superior product integrity for even the most demanding applications, contact Buckeye Shapeform at 877-728-0776 or visit www.buckeyeshapeform.com.

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