

## Deep draw delivers one-piece products

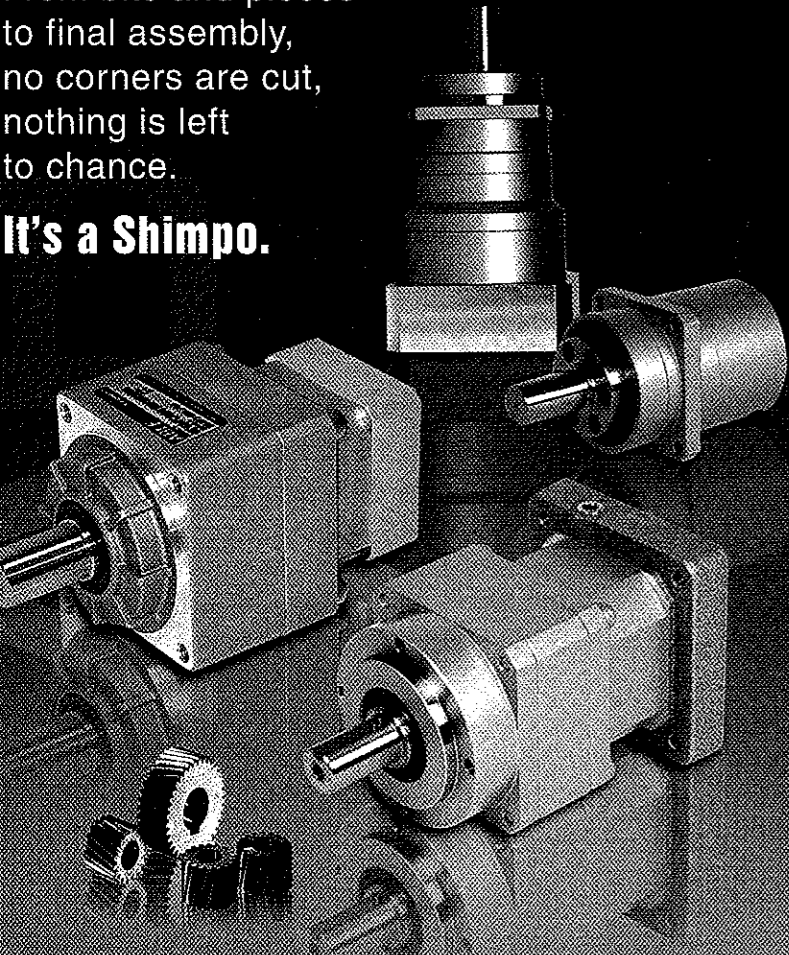
Leslie Langnau  
Managing Editor

# SHIMPO

## Nobody Does It Better

From bits and pieces to final assembly, no corners are cut, nothing is left to chance.

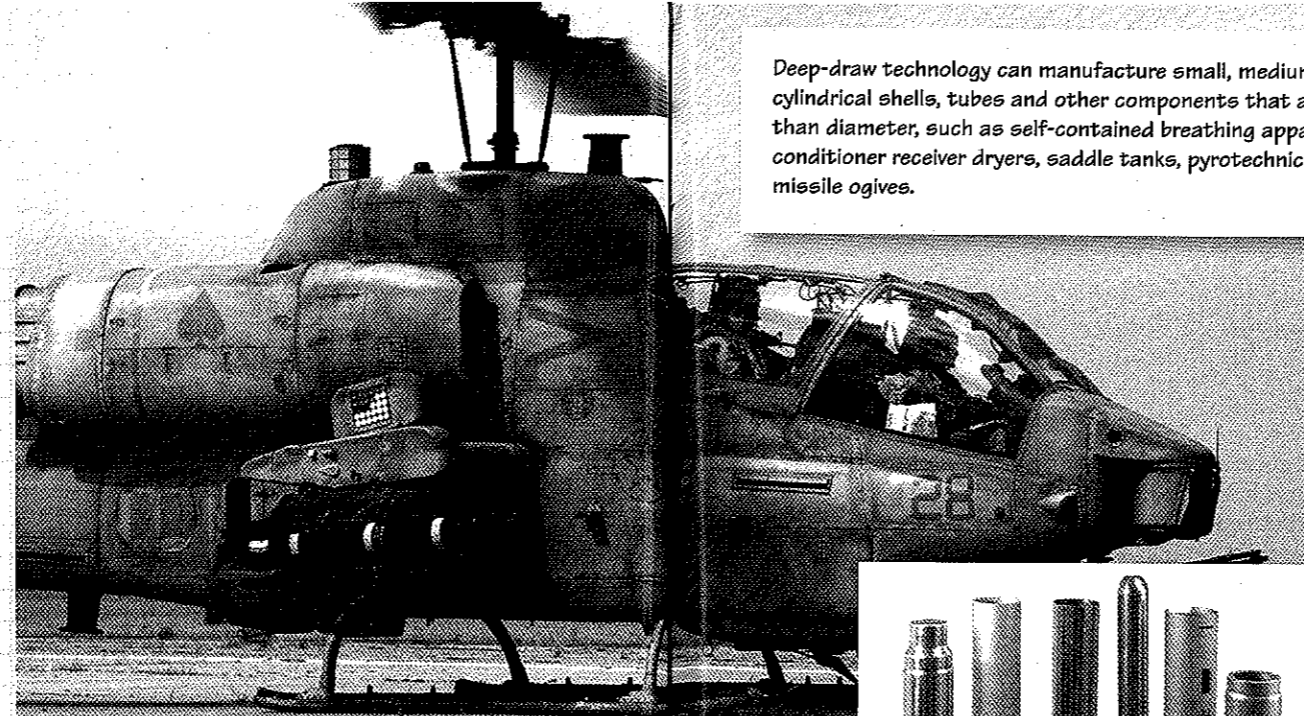
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Deep-draw technology can manufacture small, medium and large cylindrical shells, tubes and other components that are longer in length than diameter, such as self-contained breathing apparatuses, air conditioner receiver dryers, saddle tanks, pyrotechnic containers and missile ogives.

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 liners must be made with varying wall thicknesses to meet Department of Transportation (DOT) requirements to withstand test pressures of 10,000 PSI, yet be light enough to be carried easily. For buses, vans and light trucks, CNG liners with varying thicknesses also save weight and cost. And missile skins do not have to be a multi-part assembly.

Buckeye Shapeform's Deep Draw manufacturing processes can deliver such one-piece products. Many traditional processes—like impact, spinning and supplemental annealing—cannot deliver consistently reliable results for certain applications. They often use more raw materials than product specifications require, adding to the cost and weight. And they can make assembly of finished products difficult.

Deep draw technology originated as a practical option for manufacturing unique parts. The process creates complex small, medium, and large cylindrical shells, tubes, and other shapes requiring close tolerances.

The 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. Ironing is also performed during the process, which allows sections of the material to be ironed down to different wall thicknesses.

Once the part is drawn or shaped, forming begins. The necking and expanding processes create multiple diameters in a single part. Diameters can either be expanded or reduced (necked) to create forms that more exactly match product specifications. The result is seamless one-piece parts with multiple wall



Deep Draw technology was used to supply the military with a missile casing featuring a 7-in. diameter with a tolerance of just  $\pm 0.003$  in. Buckeye Shapeform's process can attain this accuracy on parts up to 84 in. in length and 12 in. in diameter.

thickness and diameters.

The multiple wall thicknesses give strength where it's needed while reducing the amount of material used, 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. Tolerances are in the thousandths.

The deep draw process relies on controlled movement. Typically when metal is shaped and formed, the material grains are scattered, compromising the integrity of the material structure.

However, the controlled movement process uses controlled speed to maximize material grain alignment in the final product. The finish is typically  $63 \mu\text{in.}$  or less, lending a smooth, mirror-like luster to the final part.

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

fers significant advantages in the final product. It is softer and more malleable, making it easier to iron the material down and create multiple wall thickness and diameters.

It 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. Buckeye Shapeform can draw components with a length-to-diameter ratio of 20:1.

Buckeye Shapeform [www.buckeyeshapeform.com](http://www.buckeyeshapeform.com)

## A Tradition of PRECISION

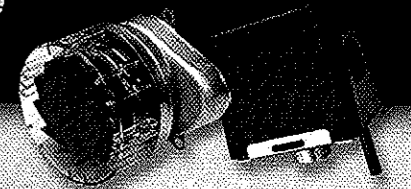
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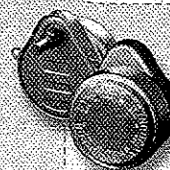
Our reputation is on the line with each motor we make. Sure, the expectations are high — but that's the Tradition of Precision we renew every day.



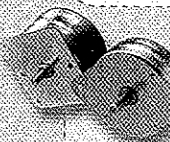
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