# A NEW PLACE TO DWELL

**ADVANCES IN PRESS TECHNOLOGY ENABLE STAMPERS TO PRODUCE HIGHLY PRECISE MEDICAL PARTS THAT COULD ONLY BE MANUFACTURED PREVIOUSLY THROUGH MACHINING OPERATIONS.**

*By Denny Boerger*

The majority of cardiovascular and surgical devices are typically made from stainless steel, with a small percentage being produced from exotic materials.

Advances in press equipment and technology offer options capable of meeting the high degree of accuracy required for medical parts processing. They include:

- Bottom Dead Center (BDC) compensation device
- Servo-driven gap and straightside presses
- A straightside press more accurate than the die
- Flow Control Forming
- Cold Forging
- Warm forming

A mechanical stamping press with an active BDC compensation automatically senses the change in BDC position and then adjusts the BDC position in real time by varying the stroke length or the shut height. The newest servo-driven gap or straightside presses can maintain bottom dead center accuracy within 10 microns by allowing the operator to monitor the position of the slide at the bottom through a linear transducer or resolver.

This function is especially suited to producing medical parts that require stamping processes such as multiple coining, or that must be formed from materials like stainless steel, aluminum, magnesium, high strength steel or titanium.

A servo-driven gap or straightside press also provides infinite control of slide position -- something that cannot be done on hydraulic or mechanical drive presses. Its direct drive offers the same maximum stroke length and torque rating as a conventional mechanical press, but allows full energy to be used at as little as five strokes per minute.

**FLOW CONTROL FORMING© (FCF) ENABLES A SINGLE PRESS TO COMBINE CONVENTIONAL PRESS OPERATIONS WITH COLD FORGING TO PRODUCE A RANGE OF COMPLEX PARTS WITH NON-UNIFORM THICKNESS IN SHEET METAL MATERIALS FOR A NEAR NET SHAPE.**

Full energy at very low speeds is especially critical to stampers wanting to enter the medical market, because it gives them the ability to conduct forming operations at slide velocities that cannot be achieved with conventional press drives. Manufacturers also gain the advantage of higher speeds, higher working energy, better control, precise accuracy, reduced power consumption and less maintenance.

Controlling slide velocity also improves formability. Instead of applying high tonnage to difficult-to-form materials, a servo-driven press can modify its velocity profile by holding pressure at the bottom of the stroke, then releasing and re-applying as needed to produce a more accurate and complete part.

Its capacitors store energy in the non-working portion of the stroke, making power consumption comparable to that of a standard mechanical press. This means that the cost of electrical power to produce a part can be reduced by as much as 30 to 40 percent or more depending upon the forming motion program.

During the last few years, an even higher precision straightside press has been introduced that is more accurate than a die. This new type of press was developed in response to industry demands


THE SIZE OF THIS DRAW FROM TITANIUM DEMONSTRATES THE FORMABILITY THAT CAN BE ACHIEVED WITH A SERVOPRO-DRIVEN PRESS.

for stamped precision parts with surface finishes that could only be achieved previously through machining operations.

This type of press can provide more than a 90 percent burnished finish on a sheared edge and maintain flatness within close tolerances. It also improves part quality and increases die life. Especially suited for flow control forming, fine blanking and cold forming applications, this press can run carbon steel and other high strength materials.

Added stiffness improves part accuracy. The equipment's ability to be more accurate than the die allows stampers to experience significant improvements over the major problems typically associated with conventional presses, such as the shimmy motion of the slide caused by shocks as the punch hits the material, or tipping caused by off-center loading and snap-through during stamping operations.


THE ULX, A HIGH PRECISION STRAIGHTSIDE PRESS DESIGNED TO BE MORE ACCURATE THAN THE DIE, IS SUITED FOR FLOW CONTROL FORMING, FINE BLANKING AND COLD FORMING APPLICATIONS AND HAS THE ABILITY TO RUN CARBON STEEL AND OTHER HIGH STRENGTH MATERIALS.

Cold forging allows stampers to achieve a near net shape. Pressure applied to the metal causes it to flow, a condition called *plastic deformation*. By positively forcing the plastic flow of material, cold forging enables presses to manufacture complex parts normally produced through machining processes. To accomplish cold forging, the press should exhibit high accuracy, strength, and rigidity. This process is especially suited to the production of devices such as pacemakers which are implanted in the body.

Flow Control Forming© (FCF) allows a single press to combine conventional press operations with cold forging to produce complex parts with non-uniform thickness in sheet metal materials. FCF enables the press to change the sectional shape of a component by positively forcing plastic flow of the material. The end result is "near net shape" components that were previously impossible with conventional press working.

Typically performed on a higher tonnage servo-driven press, FCF creates plastic deformation in areas of the die where it's required, as well as increases or decreases thickness, and creates ridges, flanges, rivets, gear teeth or O-ring grooves. Both progressive forming using coil stock and transfer forming using blanks are possible with FCF.

Characteristics to consider when selecting a press for FCF are minimum elongation and deflection. FCF requires a press that can hold strict tolerances under heavy, concentrated, and eccentric loads, almost twice that of conventional sheet metal forming. In addition to conventional sheet metal forming operations, the press must be able to complete cold forging operations such as upsetting, ironing and extrusion to achieve desired wall thickness.

Warm forming introduces heat into blanks via heated tooling and uses controlled slide velocities with the servo-driven press to physically confirm computer models, or make corrections to computer models, and establish formability parameters for specific exotic materials. The press dwells to allow the die to heat the blank. Once the material reaches the proper temperature, the part is formed.


A SERVOPRO®-EQUIPPED STRAIGHTSIDE PRESS CAN MAINTAIN BOTTOM DEAD CENTER ACCURACY WITHIN 10 MICRONS AND PROVIDE INFINITE CONTROL OF SLIDE POSITION, SOMETHING THAT CAN'T BE DONE ON HYDRAULIC OR MECHANICAL DRIVEN PRESS EQUIPMENT.

Die size, a function of heating and cooling capacity, does not affect a stamper's use of the warm forming process. The technology is also unaffected by sheet thickness, although the thicker the material, the more time it takes to warm inside the die. Parts that require alloys that are difficult to form at room temperature can be efficiently produced with warm forming.

All of these technologies and presses can support stamping operations needed to produce cardiovascular devices and a wide array of surgical tools, ranging from scissors and scalpels to handles and surgical clamps.

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- Warm Forming: A Matter Of Control
- Better Control, Better Flexibility
- Flow Control: The Future Of Drawing?

Because of lean operating practices, most companies don't employ an experienced staff that can properly specify equipment. Teaming with a press supplier that can perform the necessary legwork by evaluating production requirements can ensure the stamper invests in the right technology and press equipment.

This evaluation should answer questions pertaining to automation, quick die change, part-to-part changeover and any other features required to deliver the efficiencies necessary to support a market that demands high precision and accuracy.

A supplier with a broad line of equipment and an applications team able to analyze current and future job requirements can help define the choice.

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