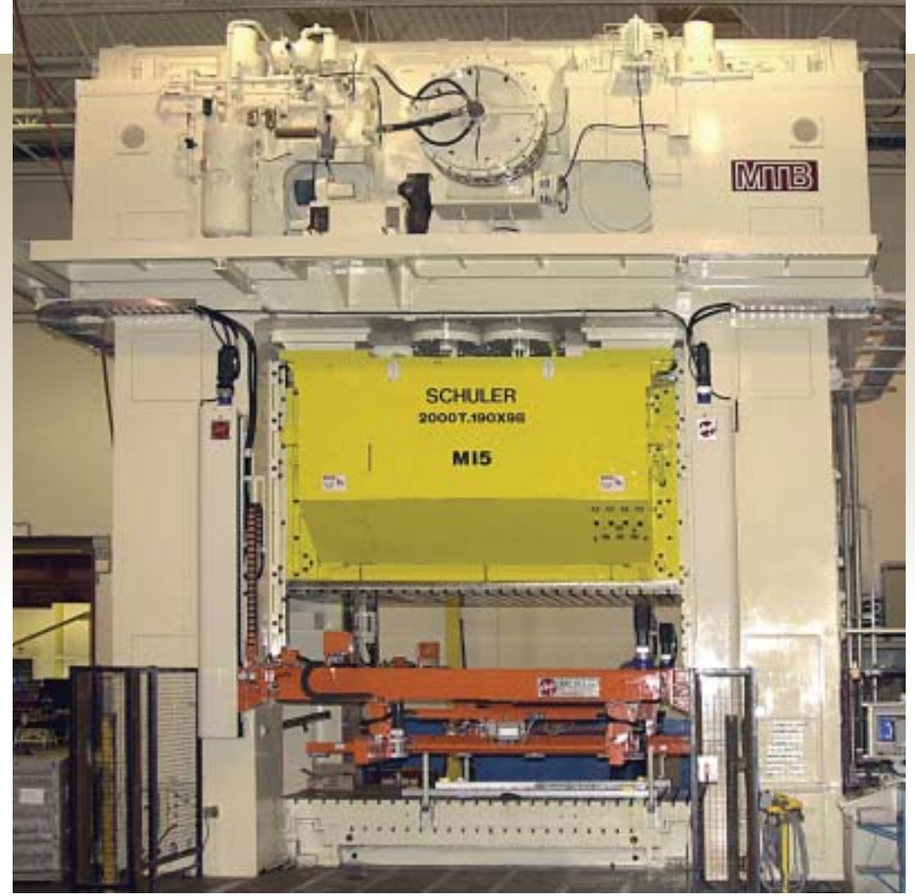
Transfer Systems

Mechanical or Servo?

What's faster, what's more flexible and what's right for you? Read on to find out.

BY LOUIS A. KREN, SENIOR EDITOR



The programmable all-servo transfer system on this press automatically controls different part configurations and motion requirements. All-servo units offer much greater motion flexibility than their mechanical brethren and have automatic quick-tool-change capability, allowing them to accommodate a greater part variety. On average, servo units cost three times more than mechanical transfers at the onset, but may pay for themselves when used for multiple part configurations. For stampers with a single press used for transfer work, here's a rule of thumb: If you are producing three or more different parts, or wish to do so at some point, consider moving from all-mechanical to all-servo transfer equipment.

Ready to take the plunge into transfer work? *MetalForming* talked to Pat Cullen, sales manager for HMS Products Co. (www.hmsproducts.com), Troy MI, a producer of mechanical, servomechanical and all-servo transfer equipment. Here's his take on how stampers can choose the right transfer system.

Who's Buying?

Mechanical and servomechanical—Today's purchasers of mechanical and servomechanical part-transfer equipment fall into these groups:

• Manufacturer of a specific product—This metalformer, with contracts to produce a specific part such as valve cover or lawnmower gas tank in high volumes, is a perfect candidate for all-mechanical transfer systems.

• Contract stamper that produces a series of parts with common sizes and geometries—If the volume is sufficient on two or three parts that are extremely similar in size, shape and required forming steps, this stamper can buy a mechanical transfer system and just change the tooling from part to part to part. If transfer timing does not need to change from part to part, the stamper can run the same transfer-system cams and only change the tooling elements.

• Stamper entering into transfer from line-die or progressive-die operations and interested in exploring transfer opportunities while minimizing initial cost outlays—This stamper has performed progressive or line-die work, but for some reason—productivity, labor content or safety—it needs to move into transfer. It can't afford a new transfer press, or just wants to see how transfer work can improve its process. This stamper typically produces in high volumes, manufactures niche products and performs relatively few tool changeovers.

All servo—Most new transfer presses today are provided with all-servo transfer systems. Many Tier One or Two stampers, to protect current contracts and to acquire new work, want the options and flexibility available in all-servo systems. These stampers need greater physical travel capabilities and programmable part-specific timing. Appliance builders, for example, want optimized profiles for each transfer move to provide improved part-handling conditions and productivity on every part. If they produce different series of dryer tops or have two different die designers creating tooling for comparable products, transfer timing conditions will vary. With all-servo transfer, these stampers are not handcuffed into optimizing for one part and making compromises for everything else. They can program the transfer systems to work optimally on various parts.

What Will It Cost?

Initial cost of an all-mechanical system is about one-third that of a press-mounted all-servo setup. For customers with a single press used for transfer work, here's a rule of thumb: If you are producing three or more different parts, or wish to do so at some point, consider moving from all-mechanical to all-servo transfer equipment.

Stampers producing three different flavors of the same backing plate or vacuum booster shell, for example, may be better off staying with a mechanical setup. But if they are not niche stampers that function within one particular component sector, a flexible all-servo system will allow them to run anything from transmission oil pans to structural parts to appliance work.

If you are producing three different parts, installing a press-mounted servo transfer unit and three tools versus three mechanical transfer units costs about the same. By the time you equip the all-servo system for a fourth part, you are ahead on cost, buying only tooling elements instead of capital equipment.

Mechanical to Servo—Simple to Sophisticated

An all-mechanical transfer unit requires minimal process electronics—sensors on all part inputs and position sensors to monitor the physical motions of the equipment. With no servo equipment involved, only mechanical service and lubrication as well as maintenance and repair of simple electronics/process-control equipment are required.

Mechanical transfers are simpler systems, less prone to equipment problems. Also, stampers don't need spare parts on hand and an inhouse support staff to get into transfer work. For these reasons, mechanical systems fit well for entry-level transfer stampers.

All-servo units, on the other hand, are sophisticated, with thousands of electronic components, any of which may shut down production in the event of failure. For this reason, companies employing servo technology need appropriate technical and maintenance staffing as well as a transfer supplier that stocks the appropriate mechanical and electrical components and offers 24/7 customer support.

Which is Faster? That Depends

Given the correct press, part configuration and process, an all-mechanical transfer system can reach higher speeds than its all-servo relative. With mechanical transfers, return motions slave directly to press slide motion. That means less chance of mistiming and the resulting misplaced part. Some mechanical transfers reach speeds of 80 to 100 strokes/min., not possible with servos. But servo units typically find use on larger, more complicated tight-tolerance parts that all-mechanical transfers can't handle, and in any case, such parts aren't expected to be produced at such high speeds.

In sum, mechanical transfers will run quicker on some parts, but with servo transfer, due to increased orientation and movement capabilities, speed is optimized for a broader spectrum of parts and processes. This is possible because transfer for each specific part is independently programmable—entry angle, lift and pitch movements can be optimized on every part to be run.

Higher Range of Motion in Servos

Typical mechanical transfer systems offer a maximum pitch (X-axis) travel capability of about 24 in., and available press stroke should exceed pitch travel. As the ratio of pitch travel to press stroke nears 1:1, transfer speed suffers. Mechanical transfer systems are capable of about 8-in. finger-clamp (Y-axis) travel and 6 in. of lift (Z-axis) travel, so tooling destined for mechanical transfer must stay within these constraints. Those limits can be surpassed in some situations.

Attempting to run a different part with different pitch, clamp and lift travel requirements on a mechanical transfer system means changing cams—a manual, time-consuming process that introduces the possibility for error.

Servo transfers offer much more in travel capability—to 60-in. pitch, 40-in. clamp and 96- in. lift. No need to change out cams with servo units as all motion occurs via the programmable servo

With mechanical transfer systems such as this, all X-, Y- and Z-axis motion is cam driven, dependent upon movement of the press ram. These systems are affordable and simple to operate for stampers looking to ease into transfer work. In general, mechanical transfers provide less motion flexibility, and tool-change time for a new part run—a manual process—can be lengthy.

motors. That larger range of motion allows for larger, more complex parts and the ability to function with a greater variety of parts. Also, servo systems can operate in two-axis, three-axis, crossbar or single-sided modes; provide independently adjustable and part-specific passlines; and accept unique part arrangements such as double-unattached.

Quicker Tool Change for Servos

Mechanical transfer systems require manual setup to go from last part off to first part off, the extent determined by how the system is packaged (i.e. press- , plate- or bolster-mounted). Automation shortens the tool-change process in servo transfers, allowing true quick tool change. For example, a servo system may include provisions for parking of tooling elements on bolster- or plate-mounted supports. Such technology locates, docks, mechanically decouples and disconnects any electrical or pneumatic elements in a transfer tool set at the push of a button, and all of this occurs in less than 2 min. The one-time cost of such capability reduces downtime and the chance of errors resulting from manual tool change with each succeeding part run. For operations with numerous different part runs each day, time savings due to quick tool change can be significant.

Choosing a Transfer System

Operations looking to add a servo transfer system must consider two basic configurations: end-mount (through-the-window) or column-mount (front-and-rear). That decision revolves around minimum and maximum part sizes, X-,Y- and Z-axis travel requirements, whether fixed or moving bolsters are employed and press geometry.

For a through-the-window servo-transfer design to utilize the bolster appropriately, the front-to-rear window opening on the press must be significantly greater than the front-to-rear bolster dimension. If not, a front-and-rear-mount transfer is the correct configuration.

Mechanical transfer systems may be run in a single press, or moved within a series of similar presses with similar tonnage capacities, bed sizes and stroke lengths. These systems can be placed on a plate with a die or a series of dies on a common plate and moved around to similar presses, insulating against press breakdown. Plate-mounted mechanical units easily accommodate part production in the front-to-back direction.

MF