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New technology helps **stampers** gain efficiencies in changing marketplace

The push to manufacture parts that are lighter, stronger and smaller has become the design and production trend of most industries today.

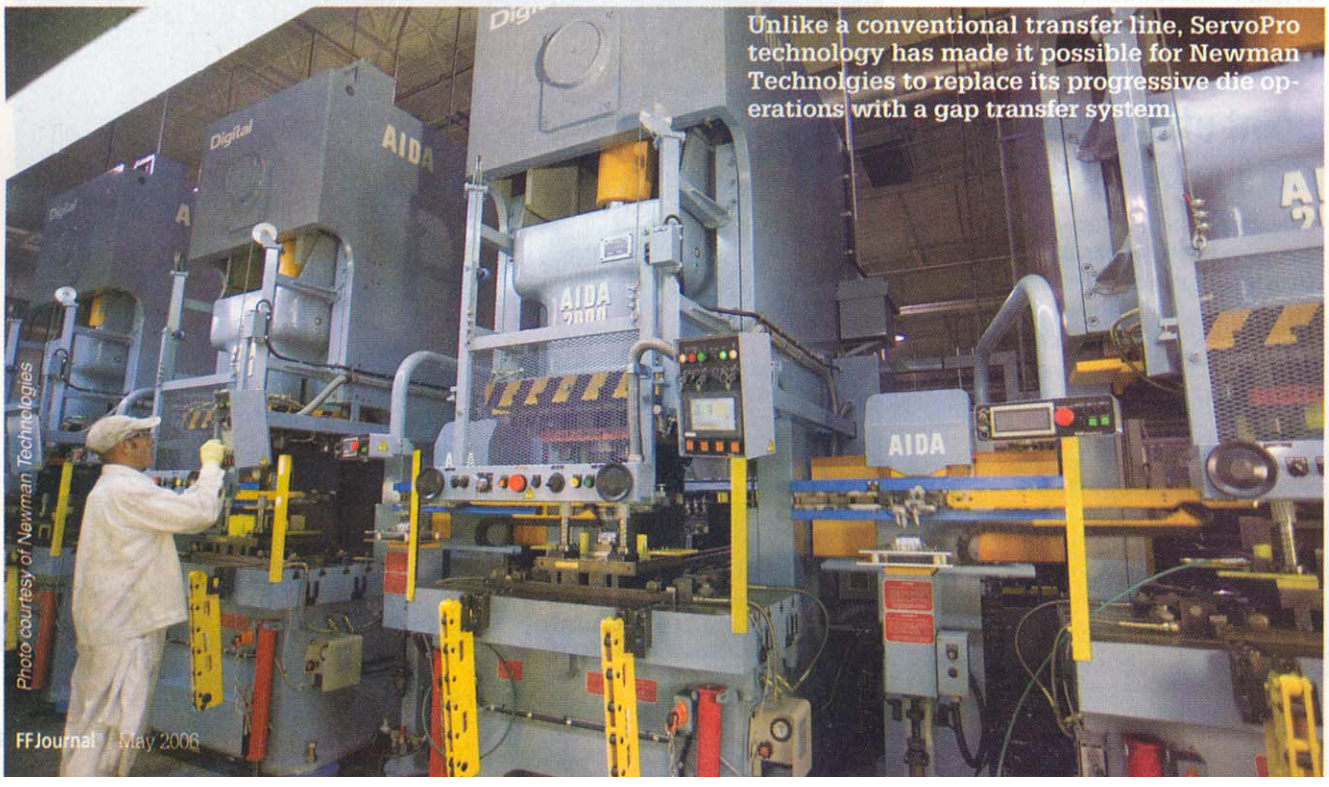
This trend, coupled with the pressure to keep costs down for the majority of consumer goods, has dictated a requirement for new materials, production processes and equipment. Stamping's need for increased flexibility and uptime has paved the way for the introduction of a significant change in press operation.

With Aida's ServoPro, stampers can produce a wide range of parts from materials like aluminum, magnesium, high-strength steel and titanium while achieving higher speeds, greater working energy, better control and precise press accuracy. This is made possible because ServoPro provides infinite control of slide position (within microns), something that can't be done on hydraulic or conventional press equipment. The key difference is the technology's original direct-drive design and proprietary high-torque, low-rpm servo motor.

The torque capacity of off-the-shelf, high-rpm, low-torque servo motors is too small to directly drive a press. A mechanism, such as a ball screw or a gear-and-knuckle arrangement, must be inserted into the drive system to amplify the limited torque available in the motor. Commercial servo motors carry maintenance instructions that suggest the belts be replaced every six months and the motor or motor controller every few years. This is not the case with the direct-drive design.

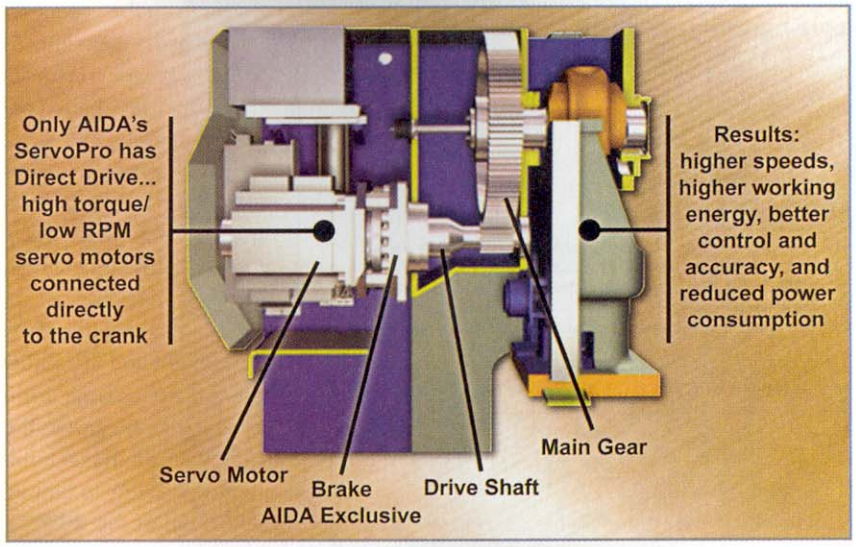
ServoPro's high-torque, low-rpm motor is mounted directly to the driveshaft of a mechanical press and requires no torque amplification. The motor provides eight times more torque at 14 percent of the maximum speed than a commercial servo motor and carries a life expectancy of up to 20 years. Constructed without belts, the direct system eliminates the flywheel, clutch and brake and main-drive motor found on a standard mechanical press.

The direct drive offers the same maximum stroke length and torque rating as a conventional mechanical press while allowing full torque to be used at as little as 5 strokes per min. Full torque at very low speeds gives stampers the ability to perform forming operations at slide velocities that can't be achieved with conventional press drives.



Unlike a conventional transfer line, ServoPro technology has made it possible for Newman Technolgies to replace its progressive die operations with a gap transfer system.

Photo courtesy of Newman Technologies



High-strength materials

Stampers in the automotive and other markets are finding that they can perform more complicated geometries and produce draws in exotic materials at higher speeds while maintaining dimensional integrity. High-strength materials exhibit a tendency to spring back to their original shape, making forming challenging. In traditional forming methods, high tonnage is applied to produce parts with tough bend requirements. ServoPro allows stampers to modify the stroke profile to hold pressure at the bottom of the stroke, release the pressure, and then re-apply it. Multiple hits can be made in just one cycle, setting the form and eliminating the need for secondary operations. Customers report a more accurate and complete part.

Blanking hard materials can also generate high reverse-tonnage loads, causing a press to experience serious maintenance issues. The servo technology's silent blanking motion permits a job that might normally run on a large press to be performed on a much smaller press without negatively impacting the equipment. Changing the crank profile and slowing the ram velocity at point of blank through can decrease overall tonnage requirements by 20 percent and reverse tonnage loads by 30 percent or more, dramatically improving die and press wear.

Historically, stampers have worked to offset the affects of reverse tonnage by following a fundamental calculation and doubling the amount of press tonnage required to produce a part. Servo direct-drive technology allows a press to be operated closer to its rated capacity by controlling slide velocity and dramatically reducing reverse tonnage. The capability of setting minimum stroke length to match the work allows a shorter working cycle time and has the ability to form high-strength materials, staking or in die-tapping, in-die assembly, dwell for material heating, and continuous running by press-to-press automation.

Slide velocity can be reduced in the upper portion of the stroke, allowing press-to-press automation to complete its function while presses run in continuous mode. Line output is increased by nearly 50 percent as compared to press-to-press transfer systems that stop at the top of the stroke to allow the automation to function.

Profiling technology

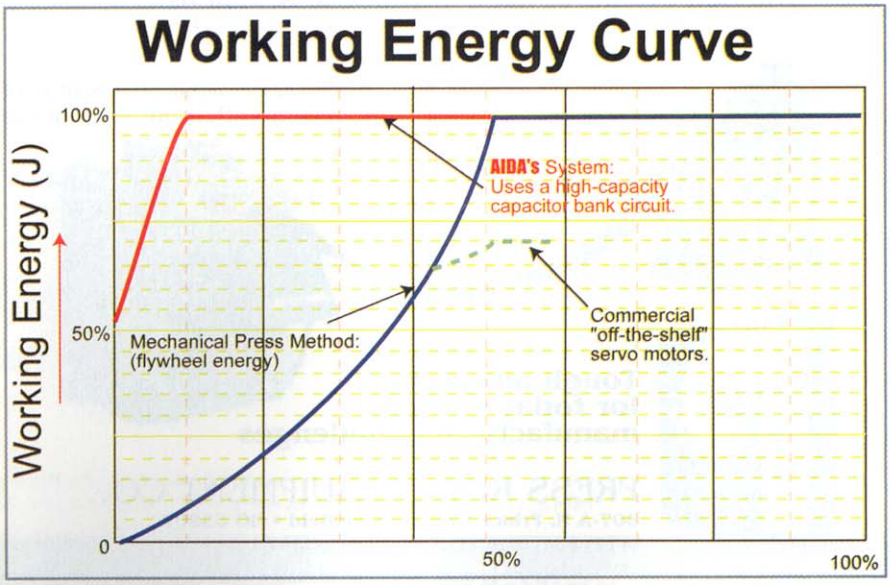
Stroke profiles can improve in-die assembly operations by including the feeding of two strips of material. The technology allows in-die welding to be performed at significantly higher output speeds. Flexibility and uptime, that are also increased by servo technology, offer preprogrammed motion curves and the ability to design programs unique to the job at hand. Preprogrammed motion curves should include:

Knuckle motion: A slow-touch knuckle motion increases working time without cutting production rates. Die life is also increased, because the impact to dies is reduced.

Slow down at top of stroke: More and more applications today require multiple operations. By slowing the slide at the top, automation systems can be synchronized while maintaining suitable forming speed and maximizing cycle times.

Short stroke: The capability of setting minimum stroke length to match the work drastically shortens the working cycle through higher press speed.

Dwell at BDC: Stopping the slide before bottom dead center eliminates die sticking and makes combined working

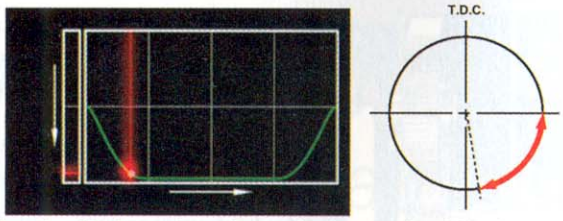


possible. Combination jobs, such as tapping work within the die and mouting of other parts, be--come easier.

Crank motion: This allows operation as a traditional crank-motion press for high production rates with superior control.

Overall clearance, working energy and power consumption characteristics must also be examined when comparing a servo-driven press with a commercial, high-rpm, low-torque motor or a direct-drive system with a high-torque, low-rpm motor. Overall clearance is a key element to machine durability, accuracy, die life and product repeatability. Because commercial motors must multiply or amplify torque, they can carry as many as five clearance points. The direct-drive system has only two support points, reducing the overall clearance by 2 ½ times.

MOTION FOR COMBINED WORKING SLIDE NOT PASSING BOTTOM DEAD CENTER



- **Since the slide does not pass bottom dead center, die sticking does not occur and combined working becomes possible**
- **Combination works such as tapping work within the die and mounting of other parts becomes easier**
- **Combination with linear scale makes bottom dead center compensation possible**
- **By fitting a linear scale option to the slide more precise bottom dead center position control becomes possible**

The direct-drive system helps achieve a higher working energy curve. When compared to commercial servo-motor drives, the working energy curve is nearly 50 percent higher. Power consumption, on the other hand, tends to be much lower. Huge capacitors store energy when the ServoPro servo motor is not under load. When the motor is loaded, power is drawn from the capacitors instead of the main line. As a result, power consumption is often less than a conventional press.

Just-in-time measures and other lean manufacturing practices have forced significant changes in how stamping is approached. Flexibility of the equipment and the ability to quickly change from producing one part to the next is essential. Servo-forming technology gives stampers the ability to handle jobs that haven't come in the door yet and to broaden lean manufacturing practices even further. **FFJ**

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