

Gas Springs

Deliver Force Where and When It's Needed

Gas-spring manufacturers have developed an array of specialized products that today are becoming mainstream. Modularization has become huge, and controllable springs and delayed-return manifold systems provide lockdown without springback.

BY BRAD F. KUVIN, EDITOR

Suppliers of nitrogen gas springs and their associated products—cams, manifold systems and the like—are “all about inducing forces in the die, safely and efficiently, to optimize the value metal stampers attain from every die station,” says Steve Reilly, manager of product engineering for gas-spring manufacturer Hyson Products, Brecksville, OH. “Today it’s a given that end users want nitrogen springs to optimize productivity and quality. Most everyone understands the technology and its benefits,” continues Reilly. “The key is creatively applying the springs to squeeze every possible benefit out of the available technology.”

Gas-spring manufacturers in the last few years have developed an array of specialized products that today are becoming mainstream as stampers learn how to fit the right spring devices to specific applications. These products include springs in many sizes designed for high-speed tasks, low-shut-height requirements and even tiny models for limited-space applications in progressive dies; controllable-force systems that allow metal stampers to customize the force profile throughout the stroke; cam systems with gas springs delivering return force in the die; and modular gas-spring packages that simplify die design and build.

Modular gas-spring products such as the stock lifters (top) and roller cam (bottom) shown here make die design and build easier.

“Modularization of tooling components has created a huge opportunity for cost savings,” says Hank Kelm, Hyson director of sales and marketing. “We see a definite trend toward use of modular components that incorporate nitro-



gen gas springs with built-in features available as off-the-shelf and interchangeable products. These modular packages—a stock lifter is a perfect example—make it easier and faster to design the die and build it, as well as to install it. The modular components more or less just bolt into the die.”

A modular stock lifter, for example, eliminates the need to design and construct what is likely a 10- to 15-component device including the keeper and shoulder bolts. Now the stamper can purchase the complete module and bolt it in. Guidance and lift are incorporated without any need for additional guide bushings or anti-rotation features.

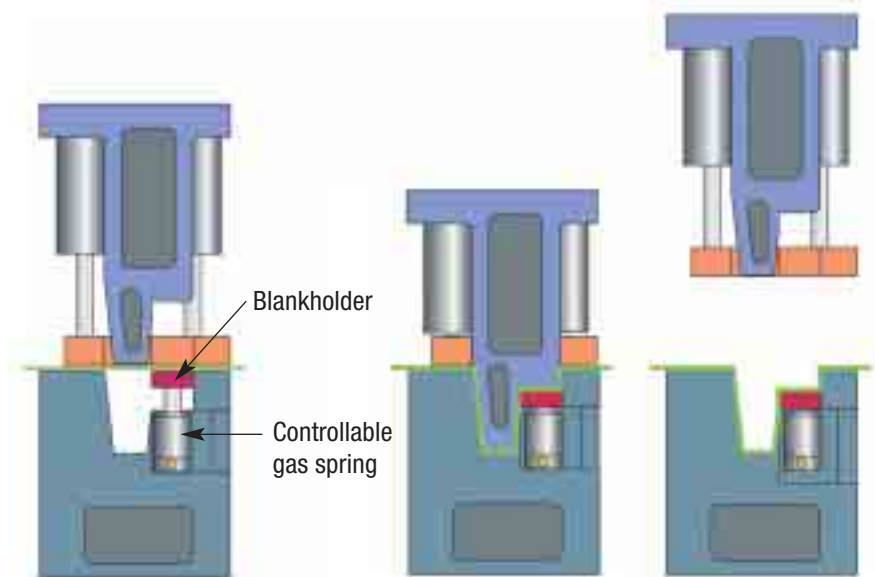
Kelm notes that cam products also are modular. “One automotive stamper recently replaced traditional aerial cams and die-mount cams with roller cams,” he says. “The roller cams last longer and require less maintenance, in addition to providing improved part quality.”

“With modularization,” adds Reilly, “the stamper avoids the upfront tooling-development costs and, importantly, the variability that comes with it. Instead, the stamper can focus on making parts and not on die engineering. Stampers are, in effect, outsourcing die design and die-component build to the die-component suppliers.”

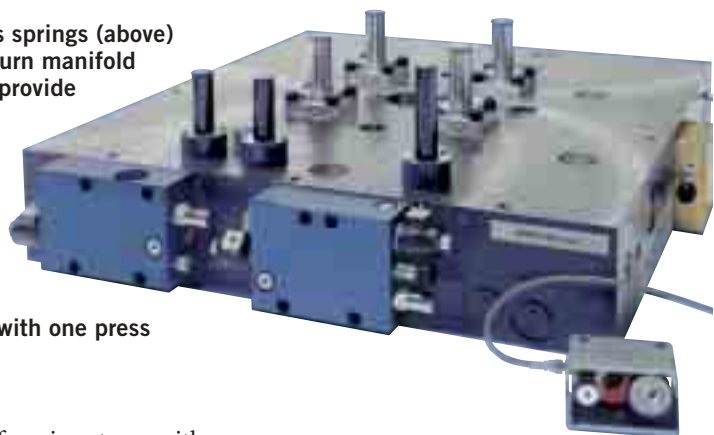
A Strong New Tooling Cycle

Through much of the early part of the decade the stamping industry witnessed much upgrading and refurbishing of older dies, in many cases replacing coil springs with gas springs. The last year or two has seen a strong demand for new tooling, according to Hyson executives. This, they say, opens the door for innovation and creativity. “We see enormous untapped potential for stampers to improve their productivity with die design and build using new spring technology,” says Kelm.

One way stampers are doing as Kelm describes is by using controllable gas springs or delayed-return manifold systems, both of which provide lockdown without springback. With these products the die produces a double-action



Controllable gas springs (above) and delayed-return manifold systems (right) provide lockdown without springback. With these products the die produces a double-action process, or two forming stages with one press stroke.



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“Some stampers using delayed-return systems have been able to reduce blank size by 15 to 20 percent,” says Kelm. “So while they have to spend more up front for the technology, they easily make that investment back by saving material. And, the springs won’t distort or flatten the part when the die retracts, thanks to the lockable blank-holding force applied during the return stroke. The stamper achieves final part shape in fewer hits, so in addition to reduced blank size, you get fewer die stations and a smaller die.”

Kelm and Reilly also say that some stampers are using the controllable self-contained springs to better form the advanced high-strength steel alloys, since they can more readily achieve final form in one shot and allow designers to make deeper forms in fewer die stations. They add that manifold systems also are popular for deep-draw applications, in place of standard self-contained gas springs that create a force

profile that rises some 65 percent from the start to the end of the press stroke. While this is desirable for some jobs, it can introduce a lot of process variation and hinder quality production, particularly in deep-draw operations.

“Manifold systems,” explains Kelm, “can produce only about a 10-percent increase in force over the length of the stroke, so you can effectively remove one process variable. Whatever binder force you have at contact remains fairly consistent through the stroke. Some stampers swear by this technology—that a virtually nonvariable force removes a lot of quality issues.”

More Quality Concerns

Quality concerns also are addressed via the addition of more models of springs with gas ports on the side, allowing them to be hosed together. This hosed system arrangement lets the stamper even out pressure among all of the springs in the die to ensure precise alignment

and improve process reliability.

“And, there now are more hose styles available to stampers,” adds Reilly, “including mini-hose systems that are easier to fit into tight spaces in and around die features where smaller springs find use.”

Also evident with recent product upgrades from gas-spring producers is increased force available from smaller springs. This results from optimized design through finite-element analysis.

“Newer spring designs offer rod diameters 30 to 60 percent larger than previous designs,” says Reilly, “with the same increase in force capacity. This lets a stamper take a die that otherwise might need 12 pressure points, for example, and design it with eight springs. Or, if you need extra tonnage at one or more of those pressure points, to perhaps form a part of an advanced high-strength steel, you can get it without needing a larger spring pocket.”

In addition to more force in a small-

er area of the die, new spring designs also are shorter than their predecessors for a given stroke length. This gives stampers increased shut height.

Lastly, stampers can opt to install a permanent cushion in the press ram that contains a normalized array of nitrogen-gas springs. Dies then are designed without any springs in the upper die, but instead with steel pins. The pins align with the gas springs installed in the cushion to transfer force to the tooling. The result: less die maintenance, fewer stocked replacement components and more efficient utilization of your gas-spring investment.

“It’s all about efficient use of working capital,” stresses Kelm.

All of this, and Safety, too

Gas springs pack a lot of pressure into a tiny space—as much as 2600 psi. Avoiding the quick and unexpected release of that pressure keeps gas-spring engineers at their design terminals,

seeking ways to improve the pressure vessel surrounding the spring to prevent gas leaks, and looking for solutions to ensure that should a problem occur, the gas vents out safely. New safety features, Hyson reports, include a guide and rod designed to absorb force and safely vent pressure should the rod extend extremely rapidly, so the gas escapes safely without the rod coming out of the spring.

“The rod has two radii machined into it, one of which cracks immediately under excess stress,” says Reilly. “This causes the seal to tear so the gas can vent safely while the second radius keeps the rod in the vessel.”

Overstroking (compressing down on the tube) also can cause concern. In this case, vessels are designed to bulge but not break, containing the guide yet allowing gas to safely escape. And, new designs of the O-ring groove features will vent gas in an over-pressurized situation. **MF**