

Better, not bigger, shock absorbers

Design engineers at ACE Controls Inc., Farmington, Mich., had their work cut out for them — design an industrial shock absorber with a larger-bore piston to absorb more energy, but keep the unit size the same. And, make it adjustable from both the front and rear.

“This is equivalent to asking automotive designers to make the engine bigger without increasing the width or weight of the vehicle, and, by the way, make it possible to drive from the front and rear seats,” explains ACE Controls’ Engineering Manager Mike Ferkany.

The solution required a perfect balance of component size and material. ACE used proprietary software that simulates and evaluates the shock absorber’s fluid dynamics and stresses prior to prototyping. They also used commercial finite-element analysis and computational fluid-dynamics software.

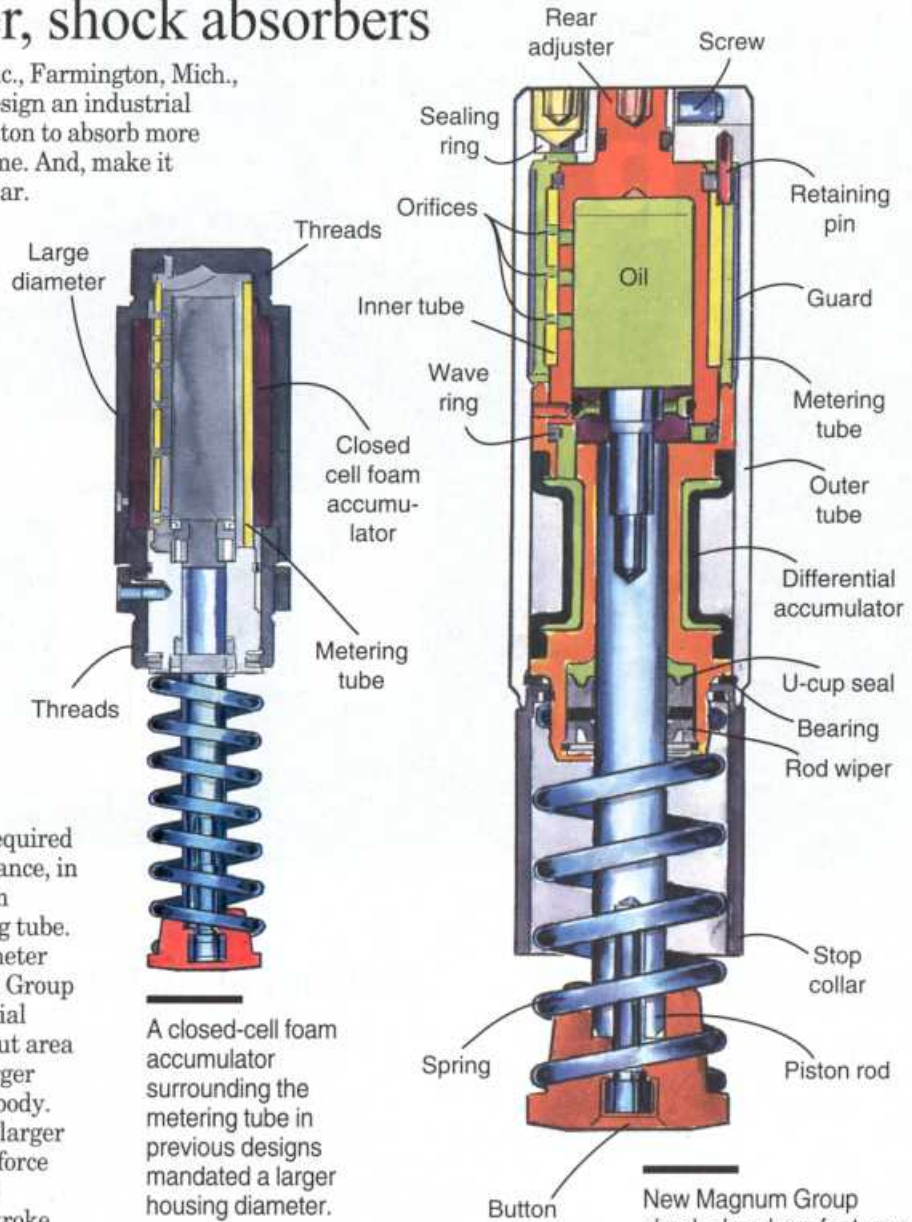
To fit a larger piston and more fluid in the same size envelope, the Magnum Group of shock absorbers required a number of design changes. For instance, in the previous design, a closed-cell foam accumulator surrounded the metering tube. This mandated a larger housing diameter and limited piston size. The Magnum Group features a new bladder-type differential accumulator that sits in a hollowed-out area around the bearing, allowing for a larger piston and a uniform, fully threaded body. With the same size stroke length but larger bore size, the absorber handles more force with the same internal pressure, and dissipates more energy in the same stroke length. Conversely, it creates less internal pressure with the same impact force. It also provides more fluid volume which broadens the effective weight range at the upper end, allowing it to handle higher effective weights.

The shock absorbers’ inner tube material was changed from low to medium carbon steel, increasing strength 40%. An integral stop collar allows for front and rear adjustments and prevents the shock absorber piston from bottoming out.

What’s called a Z-mount configuration lets the shock absorbers mount directly into air cylinders and protects against impact forces during high-speed cycling. A new polyurethane double lip U-cup seal protects the piston rod from dirt and dust while a special seal arrangement keeps cylinder air out of the shock absorbers.

With the new design, the Magnum Group, which includes both self-compensating and adjustable models, handles up to 1.5× the energy/cycle and nearly 4× the effective weight capacity as standard models. Energy ratings range from 1,350 to 54,000 in.-lb/cycle.

The shock absorbers are suitable for automotive and packaging applications as well as glass bottling and medical equipment, and large robotics, conveyors, and rotary actuators.



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