E^2 Compressor Valve Elements

When thermoplastics superseded metallics in compressor valve seal elements, reliability took a huge step forward. But today, up to 60% of unscheduled compressor shutdowns are still caused by compressor valve failures. Cook Compression® is responding with the next quantum leap in performance: E^2 elastomer-enhanced valve components.

Elastomers are polymers with elastic properties that are ideal for compressor valve service. Elastomers can sustain severe deformation and still return to their original shape. They resist high impacts and impart a cushioning effect that helps absorb shock loads. Elastomers also conform to irregular surfaces, creating a reliable, gas-tight seal long after sealing surfaces are damaged.

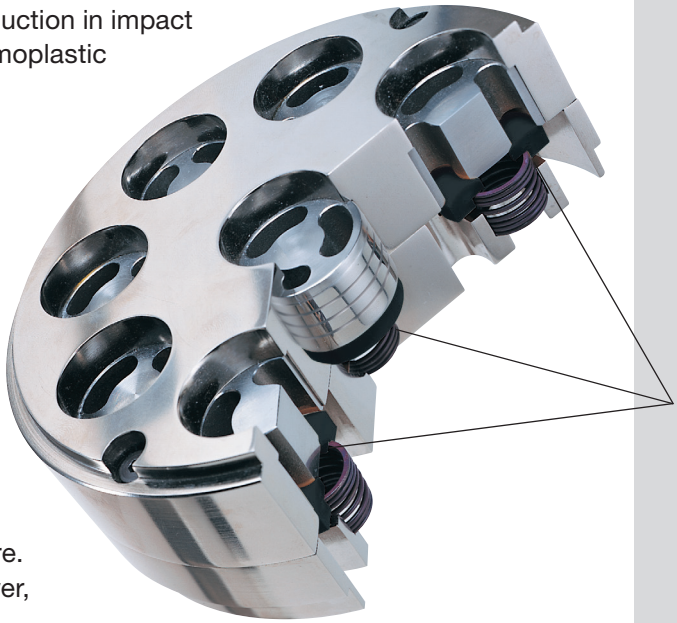
In head-to-head field tests with thermoplastic elements, MOPPET® valves fitted with E^2 elements demonstrated outstanding performance and substantially longer run-times.

ABSORBS THE SHOCK

Elastomer-enhanced elements absorb energy, allowing them to tolerate higher impacts than metallic and thermoplastic designs. In fact, tests confirm a reduction in impact energy of at least 60% versus thermoplastic elements. This makes E^2 elements more effective in these challenging applications:

Varying Operating Conditions

Valve lift/spring combinations can only be optimized for a limited operating window. Changes in speed, pressure, gas molecular weight and other conditions can cause valves to close late and with greater velocity. This often leads to plate fractures and premature valve failure. Elastomer-enhanced valves, however,



E^2 MOPPET® valve element

ADVANTAGES

- Greatly reduces or eliminates valve-related shutdowns between overhauls
- Extends compressor valve MTBF closer to planned compressor overhaul intervals
- Permits valve seat cartridges that would have been replaced to remain in service
- Reduces the volume and expense of valve repair
- Provides better valve sealing, thereby improving compressor efficiencies
- Allows compressor operators to reconsider compressor valve overhaul intervals

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DOVER® PRECISION COMPONENTS

tolerate higher impact energy, increasing their operating window and making them less sensitive to unstable or varying operating conditions.

Nitrogen-purged Systems

Hydrogen systems that require nitrogen purging prior to start-up tend to have valve durability problems. The reason is that compressing nitrogen with valves set up for hydrogen results in severe late closure and high impact velocities. Valve manufacturers often place strict pressure restrictions on the nitrogen purge cycle in an effort to protect the valves. Elastomer-enhanced valves better tolerate stresses during the nitrogen purge, minimizing plate damage during start-up and easing pressure restrictions, thereby allowing faster start-up and pressurization.

Increased Lifts

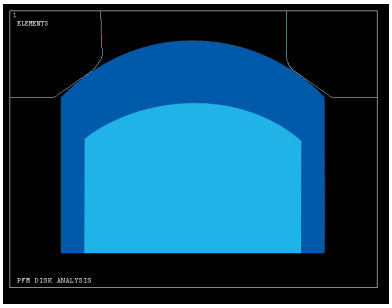
In some applications, valve lifts must be reduced in order to achieve adequate valve life. However, decreasing lift results in higher valve pressure drops, increased horsepower requirements and higher compressor operating costs. Elastomer-enhanced valves offer the opportunity to operate at higher lifts without sacrificing reliability. They provide extended run-times, with lower valve pressure drops and improved energy savings.

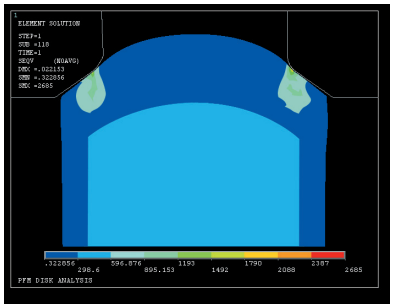
MAINTAINS A SEAL

Reciprocating compressors often ingest large quantities of non-compressible substances, such as weld slag, scale, sand and debris from upstream failures. When these solids are entrained in the gas stream, they can damage the sealing surfaces of the valve seat or the element itself. Once the valve loses its ability to form a seal, a leak forms, temperatures increase and damage cascades until the compressor is shut down and the valves are repaired.

Elastomer-enhanced seal elements have the unique ability to flex and conform to valve seats that are damaged or worn. This not only retains a gas-tight seal, but also helps protect the seat surface itself.

The improvement in sealing effectiveness can be dramatic. In a field test on a hydrogen compressor with chronic valve problems, an analyzer revealed no indications of leakage, even after months of continuous service. This extends valve service life, reduces maintenance costs and improves overall compressor efficiency and plant productivity.





Finite Element Analysis shows a cross-section of an E² MOPPET element in unloaded (left) and loaded (right) conditions. The elastomer material conforms to irregular seating surfaces, increasing surface contact and maintaining an effective seal.