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ABSTRACT: The Application of Elastomeric Materials to Reciprocating Compressor Valves

The history of valves in reciprocating gas compressors is dominated with the use of rigid materials from metal to thermoplastic polymers. Research started in 1998 investigating the application of elastomeric materials has resulted in elastomeric valves designs that not only improve the sealing capabilities of the valve elements but increase the durability and robustness of compressor valve performance. Specifically, compressor valves fail when the valve element loses its ability to form a gas tight seal. The leaking gas causes operating temperatures to rise as the leak path grows and failure progresses. Valve elements made from rigid materials can fail from damage caused by solid particles in the gas impinging upon the surface of the element or by the damage accumulated from the repeated impacts between the valve seat and the moving valve element.

The flexible nature of elastomeric materials has used to overcome the disadvantages of rigid valve elements. Elastomers can readily conform to or around irregular surface and still create a gas tight seal and the inherent energy damping properties of elastomers significantly reduces the damaging effects of cyclic impacts with the valve seat. The discussion of this technology will center of some failure modes of reinforced composites currently being used and the methods in which elastomeric materials can overcome the limitations of rigid components and dramatically improve compressor valve performance.