

HYDROGEN – ValveTechnologies' Absolute Zero-Leakage Valves

ValvTechnologies has developed advanced innovations to achieve zero leakage in quarter turn, metal seated, isolation valves. Hydrogen molecules are so small that they can permeate through base metal substrates and coatings. The picture below shows the comparative size of Hydrogen (in blue) being around one-quarter the size of Oxygen (in red) versus a water molecule (shown as 2 blue atoms plus 1 red atom). The addition of a third process to sealing components is critical in exceeding the most stringent ANSI standard, such as Class VI, for Hydrogen service.



Application Challenges

Hydrogen gas escape is closely linked to the hazards of fires and explosions. Gaseous Hydrogen, when mixed with Oxygen (a component of air), has the potential for self-ignition, is highly flammable, and can create flash fires. There are several hydrocarbon processes that involve either pure or partial Hydrogen, which should be considered during valve specifications. Liquid Hydrogen is relatively safe as compared with the gaseous state.

Differentiating Features

A third process is applied to balls and seats, in addition to ValvTechnologies' RiTech® Chromium Carbide (80% Cr3C2 20% NiCr) or Tungsten Carbide (86% WC 10% Co4Cr) coatings. This third process is unique in its ability to fill and seal inherent micro cracking and porosity found in base metals. It is applied by saturating the component area with a chemical solution at room temperature. The process uses chemical reactions and change of temperature, creating chemical bonds to both the RiTech coating and substrate. This firing also drives a reaction whereby the third process chemically bonds to both the coating and the substrate. The chemicals are drawn into all existing open pores and micro cracks. The firing converts and bonds these chemicals to the walls of the voids and fills the pores and micro cracks. Repeated cycling as sures that all these pores are filled or sealed off. The resulting coating cannot be penetrated by corrosives or Hydrogen, as there are no open pores to allow infiltration.

Tungsten or Chromium Carbide coatings in conjunction with a third process is the optimum solution for impure Hydrogen, or pure Hydrogen for pressures under 3,500 psi. For pressures exceeding 3,500 psi, a ValvTechnologies' proprietary spray and fuse process is the recommended solution.



ValvTechnologies has achieved ISO 15848-1 certification for fugitive emissions



Another unique, key element is ValvTechnologies' integral seats which means that the valve endcap and seat are one, contiguous component. The avoidance of having a separate, loose seat eliminates the possibility of gas escape behind that separate seat and the seat pocket.

The force applied by a Belleville spring pushes the upstream seat into the ball and in turn, into the integral seat becoming a crucial design consideration. ValvTechnologies' spring loads are several times higher than competitors. The highest possible forces ensure that Hydrogen cannot "leak by" the seat and the ball. In doing so, the overall valve does have slightly higher operating torques.

Testing

To assure zero leakage, every valve is 100% factory tested using Helium. Both Hydrogen and Helium are of similar molecular size, around one quarter the size of water H2O molecules. Helium is an inert gas, the second least reactive of all elements in the Periodic Table, diffuses 3 times faster through solids than air, and ultimately is much safer to use during testing. ValvTechnologies has achieved ISO 15848-1 certification for fugitive emissions:

ValvTechnologies manufactures ANSI/ASME pressure classes 300, 600, 900, 1500, 2500 and 4500 with cycle times of .2 to 1 second. For sizes above 8" cycle times will be as agreed with customers. ValvTechnologies also offers API 5000 through 30,000 6A and 6D designs.

**EMISSIONS CERTIFICATIONS
ISO 15848 . API 641 . TA LUFT**

To discuss the range of ValvTechnologies zero-leakage isolation valves, or to find out about our valve maintenance capabilities, call MCE Group Plc on 01925 202399.

