

Zwick Tri-Con Application Notes

Proven Valve Solutions for Molecular Sieve Dehydration

SITUATION

MSD demands specialized valves to effectively handle catalyst particles, temperature cycling and frequent valve cycling.

CHALLENGE

Valves must seal against catalyst with zero leakage every time while handling extreme high temperatures.

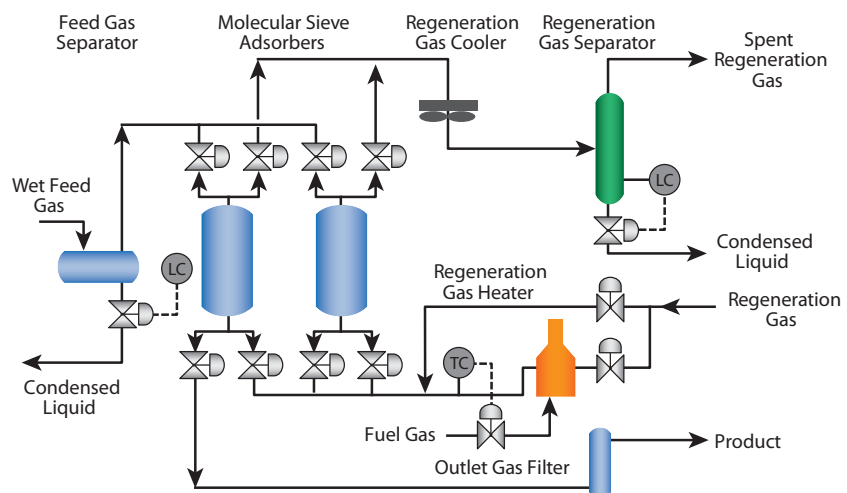
SOLUTION

Zwick Tri-Con triple offset valves use a unique cone-in-cone seating process that produces zero friction during opening and closing while consistently sealing with zero leakage.

In natural gas processing, the removal of water from the natural gas is necessary in order to prevent hydrates from forming and to combat corrosion. This process is called dehydration. One of the more popular dehydration methods is MSD or Molecular Sieve Dehydration.

MSD is used in many processes that use natural gas as a feedstock, including pipelines, natural gas processing plants, LNG regasification and power plants. A typical MSD process consists of multiple adsorption columns filled with a solid desiccant. These columns are cycled between adsorption, regeneration, heating and cooling.

An Open Cycle Molecular Sieve Dehydration System



MSD units require specialized isolation switching valves to deal with catalyst particles, temperature cycling and frequent cycling of the valves. These isolation valves control the flow of gas through the MSD process, including input and outflow to the system, and each of the desiccant columns.

Zero leakage past the valves and zero friction during the cycling of the valves are imperative. Without zero leakage, water that remains in the gas can reduce process effectiveness, and can lead to corrosion and increased dehydrator maintenance.

Valve Demands

Valves in MSD units face multiple challenges. One of the biggest challenges comes from the catalyst. MSD beds can generate catalyst carryover. This granular material can abrade the valve seat and sealing surfaces on conventional valves.

Temperature is also an issue. During the regeneration process, temperatures can range from 350°F to 800°F (175°C to 427°C). The valves will cycle frequently during this time. With conventional valves this frequent cycling will accelerate wear and reduce the life of the valves. Temperature cycling, and cycling of the valves requires high performance features.



The Zwick Tri-Con Answer

The Zwick Tri-Con triple offset, metal-seated valve delivers absolute Zero Friction during the opening and closing of the valve, and more importantly offers absolute Zero Leakage past the valve. The Tri-Con valve can offer this because of the true 25-degree inclined cone-seating plane. The Tri-Con seal ring is statically held on the disc with a 25-degree inclined angle allowing true cone-in-cone seating with no deformation of the seal ring. This feature insures there is no wear on the body seat as the catalyst is flowing thru the valve while the valve is closing. With the 25-degree cone-in-cone seating there is no grinding of the catalyst into the seat.

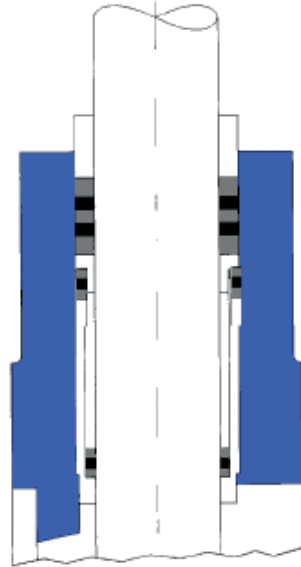
Every Tri-Con valve is tested and certified to zero leakage per API 598 Resilient Seat Test Standards. The Tri-Con can also be tested and certified to API 6D Zero Leakage upon request.

Tri-Con valves offer a Stellite 21 welded overlay on the body seat in order to offer long seat life and wear resistance helping to maintain the efficiency of the drying system.

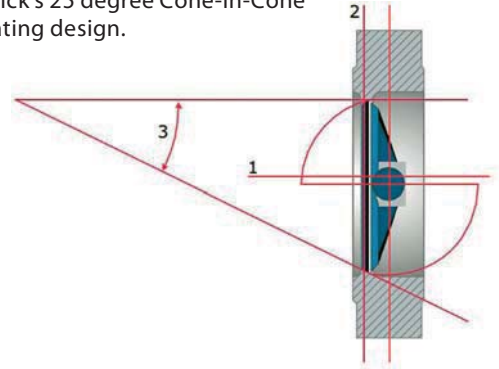
Zwick's unique Self Centering Disc addresses valve issues with temperature cycling during regeneration. The Tri-Con disc is not pinned to the shaft as with all other Triple Offset valves. Therefore, during any temperature cycling the shaft (which features a different material than the disc) will grow or contract. With valve designs that have pinned shaft-to-disc



Zwick's new Double Block & Bleed valve solution.



True Zero Friction delivered with Zwick's 25 degree Cone-in-Cone seating design.



Zwick's Patented Seal Bearing with mechanically energized and loaded graphoil packing rings seals the bearings from all process media.

this will result in either pulling the disc up during the heating process of pulling the disc down during the cooling cycle. With the Self Centering disc design the shaft can grow or contract, but the disc will always find its perfect alignment into the body seat.

The Tri-Con valve utilizes a keyed connection from the shaft to the disc providing balanced torque transmission without the threat of shearing pins. Also, the valve disc is made of the same material as the valve body, resulting in no temperature limitation due to thermal expansion and contraction up to the limit imposed by ASTM to WCB material.

Another unique feature the Tri-Con valve offers is the Patented Sealed Bearing. All manufactures of Triple Offset Valves offer a "Bearing Protection Ring", which is simply one ring of graphoil that is not mechanically loaded. This design does not keep the process media from entering the bearing cavities. Therefore any presence of particles in the process media could migrate into the bearing cavities and cause bearing failures. Zwick's Patented Sealed Bearing design has solved this problem by offering a 3-piece bearing complete with mechanically energized graphite packing rings that protect the shaft/bearing cavity from

any process media, especially any catalyst particles. The Sealed Bearing feature has proven to be the answer to protecting the shaft/bearing cavity from the migration of sulfur in Sulfur Tail Gas applications as well. With our Sealed Bearing feature it becomes the primary emission barrier and the packing becomes a secondary emission barrier. The Sealed Bearing feature can offer a 10 PPM or lower emission system.

Zwick understands that MSD applications are essential to the natural gas processing market and down time due to valve failure is not acceptable. The Tri-Con answers the challenge with Zero Friction, Zero Leakage and Zero Migration of catalyst into the Bearing Cavities.

