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TECH NOTES

VB-TN-003 **August 16** **R. HANSON**

Varec Biogas Safety Selector Valve

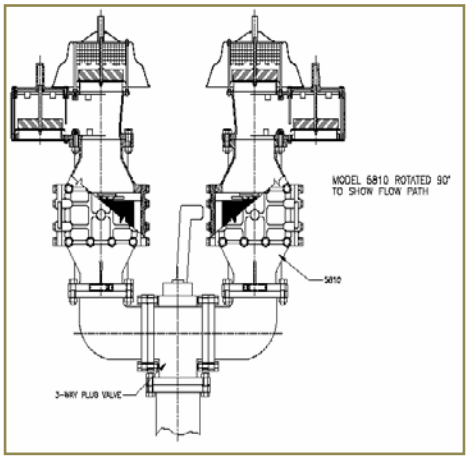
The Safety Selector Valve (SSV) presents a cost-effective and superior alternative to the traditional three-way plug valve.

Digester Protection

Water Environment Federation, Manual of Practice No. 8 (MOP 8) recommend that digester and gas holder covers should be equipped with pressure and vacuum relief valves to protect the cover from structural damage caused by possible over- and under-pressure caused by the rapid pumping of the sludge into and out of the vessel, or from an excess of gas production.

The valves are installed with flame arresters to prevent an external flame from igniting the gas within the tank. The combination Pressure and Vacuum Relief Valve (PVR) With Flame Arrester Assembly is the Varec 5810B/5820B Series.

Due to the harsh service conditions, maintaining these units are critical in ensuring that the PVR valves operate properly and minimize gas leakage. MOP 8 recommends that two Pressure and Vacuum Relief Valve with Flame Arrester Assemblies be mounted side-by-side on extending pipe and elbows with a three-way plug valve. The valve provides a means to isolate one set of equipment while safely performing maintenance functions on the other (See figure shown on right).



Pressure Loss

In order to properly size a Varec 5810B/5820B Series PVR valve With Flame Arrester, one must know the maximum flow capacity, the system's operating pressure and design pressure. It is imperative for the unit to relieve required flow capacities before reaching the maximum allowable pressure of the digester in order to protect the digester from a tank explosion or implosion.

Oftentimes, the pressure losses through the three-way plug valve are not accounted for when sizing the PVR valve and Flame arrester assemblies. Three-way block valves with pipe elbows commonly result in high inlet pressure loss, and contribute to excessive flow turbulence to any PVR Valve with Flame Arrester Assembly. This means that the three-way block valve usually need to be one or two pipe sizes larger than the PVR/flame arrester assembly in order to meet the design requirements.

Given the characteristics of biogas, the high-pressure loss through the three-way block valves and pipe elbows becomes more significant if any Pressure and Vacuum Relief Valve and Flame Arrester is not properly maintained.

The Safety Selector Valve has been specifically designed to overcome the limitations of the traditional three-way block valve and pipe elbow assemblies. The unique plug design and its optimized flow profile results in minimized pressure losses, sometimes negligible for most applications. The pressure losses through the SSV are typically less than 1/10th of the traditional three-way valve with pipe elbow arrangement.

Safety by Design

With the three-way block valve arrangement, it is difficult to determine which process side is active, and which side is isolated. The typical design of three-way block valves may allow the possibility of leaving the digester unprotected during switch-over of the active process side. In larger sizes, the three-way plug valves come with bevel-gear operators that can tend to stick after long-term exposure to weather.

The SSV uses a patented rotor and isolation disc along with built-in seat equalization to insure that the unit can be operated easily and quickly, even after long periods of inactivity. A bright red position indicator provides visual identification to the active process side.

The Varec SSV is now available to replace the old conventional method of using three-way block valve and pipe elbow assemblies (see photo right).

Bypass or Tandem Valve

The SSV can also be used in-line. It is ideal for use when all vented gases from the PVR valve is “piped-away” instead of merely being vented to atmosphere. In highly urban areas, it is now typical to pipe vented gases to odor absorption scrubbers to help eliminate noxious odors emanating from the digester (see photo left). Using a safety selector valve will minimize piping required.

The Safety Selector Valve can also be installed on metering lines or maintenance bypass lines. The SSV reduces the number of isolation valves and minimizes space requirements. In low-pressure biogas systems, pipe elbows, tees, reducer nozzles and isolation valves all contribute to line pressure losses the plant cannot afford to have.

Operation

The SSV uses a Rotor and Isolation Disc assembly. Referencing the figures shown below, the SSV operates as follows:

Figure 1: The red indicator is used to move the retraction bushing. In this figure the process connection on the right is active because the red indicator is pointed on this connection. The process connection on the left is isolated or on stand-by. The available padlock hasp is open to allow rotation of the rotor and disc assembly.

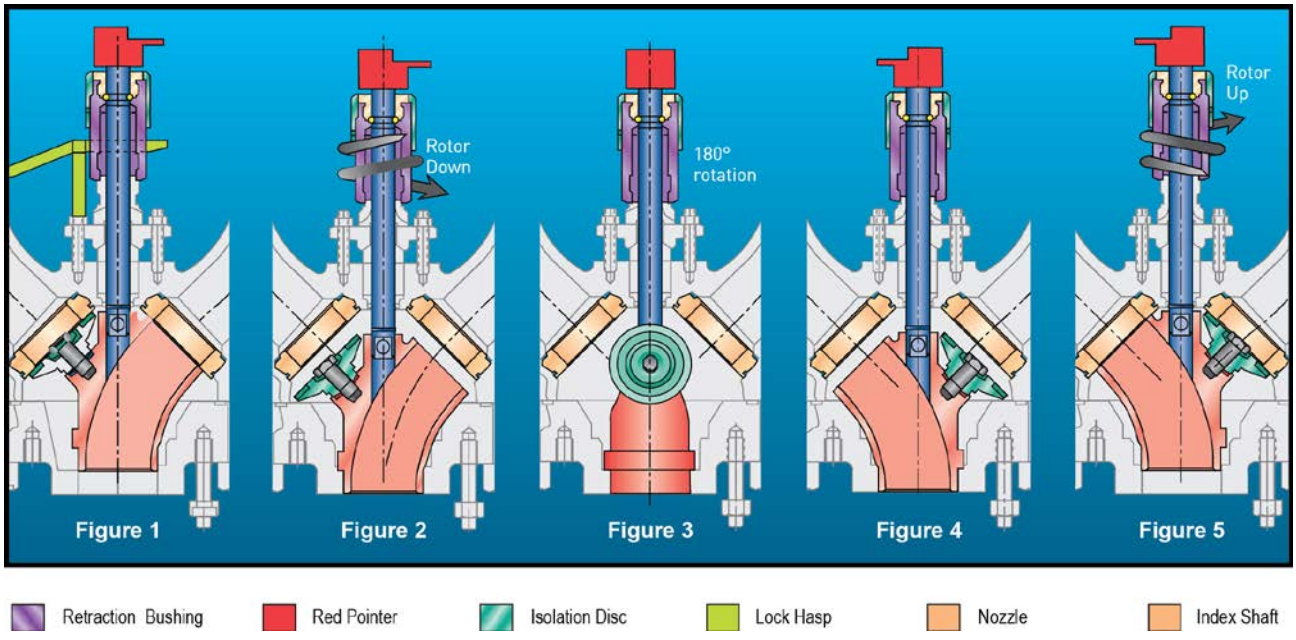
Figure 2: Rotating the Retraction Bushing through the red indicator in the clockwise direction until it hits a stop in the SSV body will lower the Rotor and the Isolation Disc away from the Nozzle or seat. In this position, both sides of the SSV are now fully pressurized by the system.

Figure 3 and 4: Rotating the Index Shaft 180º to its stop is preparation for the final step to isolate the right process connection, and activate the left connection for service.

Figure 5: Rotating the Retractor Bushing counterclockwise will raise the Rotor and carefully seat the Isolation Disc against the left side Nozzle. Once the disc is properly seated against the nozzle, the operator can activate the lock hasp and can padlock the unit to prevent unwanted access to the PRV valves. The red indicator will now point to the other side as being active.

The unit has built-in seat equalization and the whole operation of the rotor and isolation disc assembly takes less than one minute to complete. There are no special tools required to operate the unit minimizing maintenance downtime.

More importantly, operating the SSV prevents the possibility of leaving the digester unprotected at any time during the switch-over of the operating process connection.



Materials of Construction

The Safety Selector Valve offered for biogas application is available in materials of construction suitable for biogas service translating to longer wear and tear. The body and base is provided in lightweight aluminum with all stainless steel trim parts. This allows for a unit that provides superior protection against corrosion without the need for special coatings or linings. It also delivers less weight loading on the digester cover.

Specification

The use of a SSV will greatly reduce field installation costs and space requirements because of its compact design. It also eliminates the need for isolation valves and additional piping, thereby reducing overall cost.

As an additional feature, the Varec SSV incorporates a bleed valve on both process connections to provide a safe and effective means of venting entrapped gas prior to servicing. It also enables field-testing on the PRV valve when set pressure adjustments are made.

A bright red indicator for positive indication of the active process connection is available so there is never any question on which process connection is active. The foolproof provision for dual padlocking will prevent unwanted access to the units.

Its most important design feature is operation simplicity. It offers the end-user with total low cost of product ownership.

The SSV is now available with the Varec Biogas Safety and Handling Product Line. Please contact your local sales representative for pricing and additional information.