



Everything you need in a control valve

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In the choice of zero leakage valves for open/close functionality, Triple Eccentric Valves also known as Triple-Off-Set valves (TOV) are gaining in popularity. This type of construction can provide many advantages including zero leakage, compact design, frictionless functionality and maintenance-free operations. All these reasons have contributed to the increase in their popularity. Within fixed limits, TOV's can also be used for control and/or throttling applications. To extend the range and create an efficient high performance control valve, Zwick developed it's TRI-SHARK Triple-Off-Set valves.

TRI-SHARK "Throttling Trim Cartridge"

Zwick designed and patented the "Throttling Trim Cartridge" cartridge to transform TOVs into excellent control valves as well. The revised design is equal in control performance to a globe or rotary plug valve, but incorporating much better shut-off capabilities while being significantly lighter in weight. By combining the "Throttling Trim Cartridge" together with the TOV series TRI-CON, Zwick created TRI-SHARK, it's zero leakage shut-off and control, Triple-Off-Set valve.

This valve combination provides numerous advantages. On the one hand, it includes all the pros of Triple-Off-Set valves, while the other it features all the special qualities of an excellent control valve. Now, just one style of valve can be used for both, on-c and control applications.

The "Throttling Trim Cartridge" is designed fixed with the body while the valve's disc pivots, enabling the flow between disc and cartridge to be as low as possible. Furthermore, the cartridge is manufactured with multiple, optimised slots, which divide the fl and clear an exact calculated cross section while opening or closing the valve.

Equal percentage flow characteristic

With the "Throttling Trim Cartridge" the valve's flow characteristic is changed to an equal percentage flow, which is the preferred inherent flow characteristic for the majority of control applications. TRI-SHARK's flow characteristic makes sure that the valve is able to provide an effective control range from 5 up to 30 degrees of travel, the control area where traditional high performance butterfly valves seem to reach their limits. Typical TOVs and ordinary high performance butterfly valves have good control limits between 30 and 70 degrees of travel. TRI-SHARK valves extend this range through the characteristics of the "Throttling Trim Cartridge". The cartridge and valve design, with respect to streamed flow, is engineered for ideal flow control in this area.

TRI-SHARK control valves have an effective control range that extends from 1% at 5 degrees of travel to 100% at 90 degrees of travel, and its equal percentage flow characteristic fit the vast majority of control loop requirements.



Low to high flow capability

The TRI-SHARK “Throttling Trim Cartridge” eliminates the low angle instability inherent in most quarter-turn control valves. For instance, ordinary high performance butterfly valves exhibit poor control at angles of opening that are less than 30 degrees. TRI SHARK technology greatly extends the control range of quarter-turn valves to as low as 3 degrees of valve opening, while also providing noise attenuation and anti-cavitation benefits.

As the TRI-SHARK disc turns within the “Throttling Trim Cartridge”, the flow is first controlled via the clearance between the disc edge and the solid, tapered portion of the cartridge; then through the multiple, optimised slots; and, finally, through the additional open area of the valve.

Anti-cavitation properties

Further advantages of TRI-SHARK valves are the anti-cavitation properties. TRI-SHARK’s 25% higher incipient cavitation index allows for higher pressure drops than ordinary high performance butterfly valves, while exhibiting much less noise, cavitation, and damage. Even if cavitation does occur in higher pressure drop situations, the shorter vapour jets produced by the slots will avoid the damaging effects caused by larger vapour jets, referred to as “super cavitation”.

The flow is divided through the slots, which reduces cavitation because the stream bubbles occurring in the cartridge slot area are of a smaller dimension due to the smaller flow rate of each channel. Therefore, the energy released is less when the stream bubbles implode. Furthermore, especially at small opening angles, TRI-SHARK valves are able to conduct water jets concentric to the pipeline’s centreline, thereby converting kinetic energy to a smaller level prior to contacting the pipe wall.

Flow laboratory tests verified how individual water jets impinge upon each other at approximately one pipe diameter downstream from the TRI-SHARK control element, thereby converting kinetic energy in the fluid prior to contacting the pipe wall. Thus less damage at the pipe wall can occur.

As the mass flow is divided into smaller parts through TRI-SHARK’s throttling slots, the sound frequency is rising, and the result is that the sound can be absorbed more easily through the pipeline, and the frequency is in a region where the human ear notices less. Optional resistance plates can be added for even more attenuation.

More control with less torque

Another important aspect of the throttling trim cartridge is that the dynamic torque is reduced by the changed pressure field. This means that at critical opening angles and flow conditions, with regards to the necessary dynamic torque, a smaller actuator requiring less power can be used.

TRI-SHARK’s dynamic torque requirements are 60% less than ordinary high performance butterfly valves, even at high-end CV thereby providing exceptional stability throughout its control range. The Triple-Off-Set metal-to-metal seat requires lower breakaway torques than either high performance butterfly or rotary plug control valves, and its extended torque reversal point allows for an expanded range of control.

Standard types and applications

TRI-SHARK can be offered in standard body styles including wafer, lug and double flanged up to DN900 (36”).

By combining the “Throttling Trim Cartridge” with TOV technology, just one style of valve can be used for both on-off and control applications. It is the smart choice for today’s control systems engineers involved in applications such as chemical and synthetic fuels, oil and gas production, power generation, pulp and paper, water treatment, mining and metals and shipbuilding.

In comparison with other control valves, TRI-SHARK offers realisable benefits referring to acquisition costs, weight and geometrical dimensions, and leak tightness and control characteristics, especially in larger diameters, ensuring lower Total Cost of Ownership (TCO).

For more information contact Fred Venter, Valve & Automation, +27 (0)11 397 2833, sales@valve.co.za, www.valve.co.za

Credit(s)

Supplied By:	Valve & Automation
Tel:	+27 31 579 2593
Fax:	
Email:	sales@valve.co.za
www:	www.valve.co.za

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