



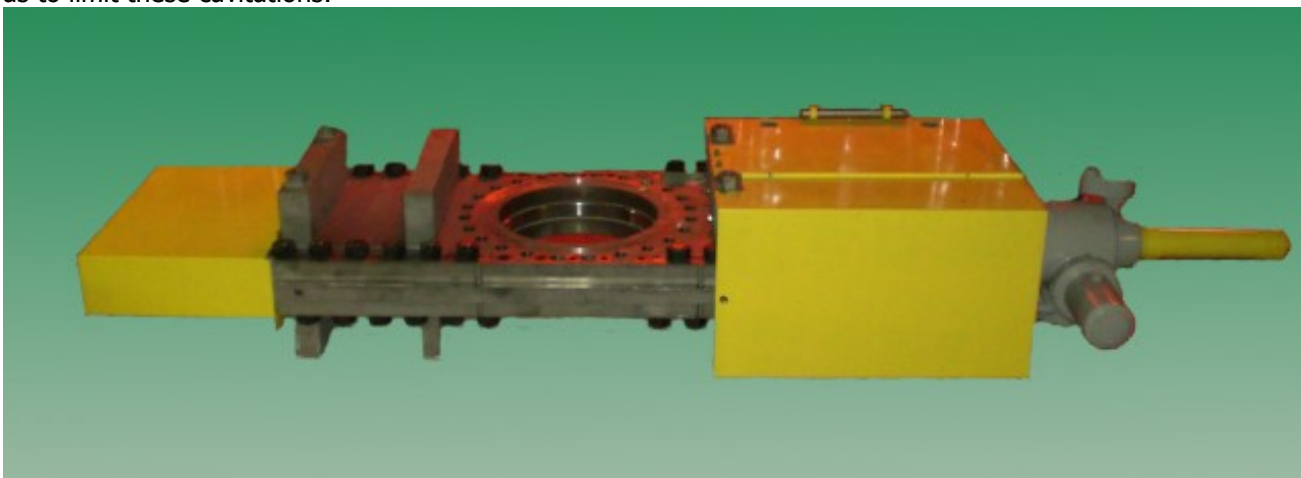
Stargate-O-Port-Valve® Hydroelectric Power Valves

The Main Penstock Isolation Valve covers a very crucial role in the safe and efficient operation of a hydroelectric power plant. In large hydropower generating plants these valves are measured in feet and not inches. The function of these valves is to isolate the turbine from the conduit/penstock when repair or maintenance work needs to be performed on the turbine or generator. As these large valves age, they can no longer be operated under traditional actuation.

In order to move the older Main Penstock Isolation Valves, a bypass is installed to flood both sides of the valve, equalizing the pressure. This pressure equilibrium allows the Main Isolation Valve to move and isolate the turbine and other downstream processes from the penstock. Bypass lines can vary in size and design, but typically there are at least two valves on each bypass line. One valve is used for isolation and the second valve is used as a control valve. The isolation valve is used to isolate the bypass line, allowing access to the control valve for maintenance, there are several issues that occur in these bypass lines with the traditional valve selection.

The main issue with traditional valve selection is that the valves are not full ported or have some form of flow restriction. Plug valves, angle valves, and other types of flow control valves have been used in tandem to as control valve and isolation valve. Although these valve types are well suited as control valves, they do cause cavitations in the line due to the flow restriction. The cavitations casue wear on the downstream piping and the necessity to replace piping, especially elbows, on a regular basis.

The other issue with traditional valve selection in the bypass line is the requirement for the valves to handle very high flow velocities. Depending on penstock size and line size these velocities can be in excess of 100ft/s. At these velocities, cavitations can cause instability in the system so it is crucial to select and operate a valve in such a fashion as to limit these cavitations.



24" 300# Stargate-O-Port-Valve® w/ Electric Actuation; Main Pensock Isolation Valve Bypass Isolation Valve



Valve Selection

Cavitations

Cavitations form as a consequence of pressurization and subsequent release of pressure. The entrained air bubbles "explode" resulting in the cavitations. Earlier installations using ball valves have proven unsuccessful. In a ball valve, the main issue is the re-direction of flow that is inherent to the design. As the water from the penstock enters the valve, is re-directed twice, and then exits the valve, additional turbulence results in magnified cavitations. The redirection of flow in a ball valve is responsible for the pressurization and subsequent pressure release causing the cavitations.

Piping Layout

The layout of the piping in the bypass line is also a consideration point in valve selection. Bypass lines should use sweeping angles to prevent the buildup of turbulences and cavitations around sharp redirection of the water. Sharp elbows and other restrictions in the flow path will lead to cavitations downstream of the restriction resulting in damage to the piping on hand of the cavitations. Angle valves present a similar problem on hand of the "angle" in the valve. It is not uncommon for piping to be replaced as often as every 12-24 months on hand of the cavitations generated from sharp angles or valves that present a restriction in the flow path.

Flow control in the bypass is often required to some form of cavitations will always be present. Steps should be taken in valve selection to minimize the the cavitations and there are alternatives to the traditional selections of angle or globe valves.

The SVC Solution

The bypass valves require a tight shut-off so that safe work downstream of the main valve is possible. They also need to be able to withstand the high water flow velocities, often in excess of 100ft/s. Furthermore the valves should cause a minimum amount of cavitation when in the partially open position.

The Stargate-O-Port line of specialty valves can resolve many of the causes of the cavitations and together with piping changes, can definitively improve the time between required maintenance on the bypass line components, whether it be piping replacement or valve refurbishment.

Design Characteristics

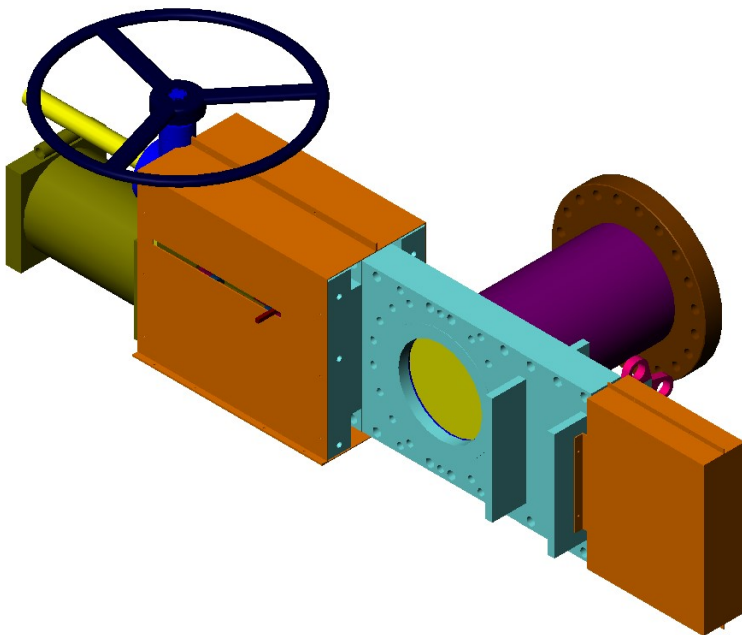
The design characteristics of the Stargate-O-Port-Valve[®] make it ideally suited for bypass isolation service and custom designs of the Stargate-O-Port valve can be utilized for the control valve function in this service.

The Stargate-O-Port-Valve[®] has a full, smooth port design that does not generate any more turbulences than a standard run of piping. The seats are on the ID of the valve so that there is virtually no gap across the valve where additional turbulence can be generated. The ID is also machined to ensure that there are no variations in "pipe" ID where cavitations can be generated. For isolation service, the valve is equipped with a pneumatic, hydraulic, or electric actuator to actuate the valve in a manner to minimize the impact on the sealing surfaces of the valve. Cavitations are minimized and seat exposure to the high velocity water is limited to a very short period of time. The design allows for an extended service life with drip tight isolation.



The Stargate-O-Port-Valve® is customized to the individual process and safety requirements of the user.

1. Fail Safe Design: Through the use of an accumulator system, the valve can be set up to fail closed if there is a loss of electrical signal or supply pressure to the actuator. This system can also be set up based on manual switch at the valve location.
2. Locking devices: Padlockable locking devices can be supplied for the open and/or closed positions to lock the valve and prevent accidental actuation of the Stargate-O-Port-Valve®. Based on site specific space restrictions, the locking device is designed to be accessed from one side of the valve.
3. Manual Override: A manual gear operator can be supplied as a secondary actuation option in the event that no supply air pressure is available.



Rendering of a 14" 300# Stargate-O-Port-Valve® with manual override



STAINLESS VALVE CO.

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History in Hydroelectric Service

SVC has been involved with hydroelectric power generation for a relatively short period of time. The first Stargate-O-Port-Valve® was put into service to replace ball valves in the Main Isolation Valve bypass isolation in 2005 after exhaustive testing. The initial valve was subject to testing to simulate 40 years of service. Following the test, the valve was passed without further inspection since the shutoff was still drip tight.

Based on the successes and proven performance of the first installation the Stargate-O-Port-Valve® has been recommended to other users. To date, a total of thirty valves ranging in size from 8" to 24" for 150# and 300# service have been supplied to isolation valve service on Main Penstock Isolation Valve bypass.

With the proven performance of the Stargate-O-Port-Valve®, SVC welcomes the opportunity to speak with you about your Main Isolation Bypass system and the utilization of the Stargate-O-Port valve in that service.

About Stainless Valve Co., Inc.

Located just outside Charlotte, NC, USA, Stainless Valve Co. is a custom specialty valve manufacturer that engineers valve products specific to the individual application. We focus mainly on critical, demanding, and unique valve applications where we are mainly replacing ball valves with our products, but also knife gate or wedge gate, butterfly, and others for applications where those valves do not perform, cause maintenance and reliability issues, or fail after a short time in service.

We produce relatively large size valves between 4" and 72" diameter, 150#, 600# 900# and 1500# service, ANSI, JIS and Metric. Most of the valves are automated; pneumatic, hydraulic or electric, but are also available in manually operated versions. SVC manufactures products in 300 series and Duplex stainless steels, Hastelloy, Inconel, titanium, carbon steel, or any other material available in a plate form.

SVC is not a manufacturer of cheap, off-the-shelf type of valves but gets involved when such valves do not perform or fail prior to one year of service. The Stargate-O-Port valve is the solution to your valve problem. We have proven this in a variety of heavy industry including: pulp, petrochemical, mining, food, biomass energy, and power generation. We welcome the opportunity to discuss your valve related issues and what SVC can offer to resolve those issues.

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Our company is certified ISO9001:2008 / Certificate No.: CERT-0090755

