ASR RESOURCES

V-Smart BIC-V™
Borehole Injection Control Valve™

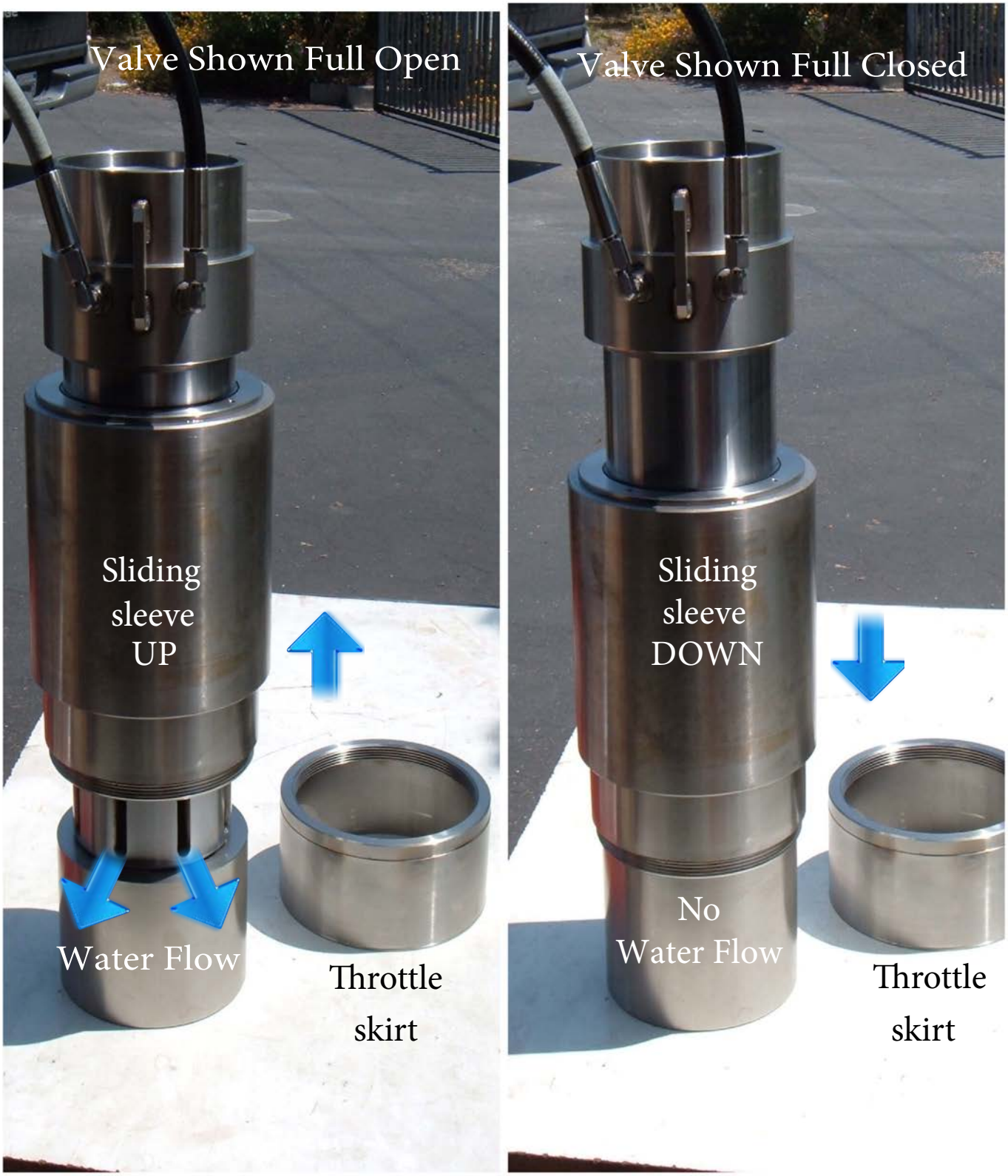
V-Smart BIC-V Borehole Injection Control Valve™ - Function

- Bi-directional, sliding sleeve, multi-port, all stainless steel, borehole injection control valve, conforming to NSF-61 material requirements.
- Works with vertical turbine, submersible and non-pump applications.
- Installed above the bowls of a pump and is submerged below the static water level or maximum expected draw down level during pumping operation.
- Maintains a variable back pressure in the drop pipe to maintain wellhead pressure above atmospheric pressure to prevent cascading water and air entrainment, while providing precise flow control into the injection well.
- Full port internal diameter allows the pump line shaft on vertical turbine pumps to extend through the center of the valve, while leaving a large flow area for minimal pressure drop.
- Designed specifically for injection well flow control and recovery pumping through the same valve in a single injection/ recovery pumping column pipe.

Hydraulic Power Unit and Hoses

- Hydraulic Power Unit (HPU), located above ground and housed in a Nema 3R steel or stainless steel enclosure, actuates the valve by pulsing the valve open or closed, utilizing food grade mineral oil to drive the valve to a desired position for the preferred injection flow rate.
- 120VAC, electric hydraulic pump, 3-gallon reservoir, temperature-activated fan ventilation, front-mounted, lockable access door.
- Digital communication of status and control is provided via Allen Bradley CompactLogix PLC and Panelview 5000 HMI multifunction display.
- Optional, internal door-mounted, Hand-Off-Auto selector switch, Pump Start – Pump Stop push buttons, and Valve Open/Valve Closed push buttons with lights for HPU Power On, HPU Pump Running, Valve Driving Open/Driving Closed, Full Open/Full Closed position indications. (As shown to the left)
- Connection between the HPU and the valve with dual-line hydraulic hoses, conforming to NSF-61 standards, with stainless steel quick disconnect fittings, These are strapped to the column pipe by the contractor during installation.
- Pressure transducers and 3,000 psi oil-filled pressure gages are mounted inside the inner door to show output pressure from the pump and hydraulic hoses.

V-Smart BIC-V™ Valve - Throttling



V-Smart BIC-V™ Key Features

- Full hydraulic actuation
- Space saving External sliding sleeve design
- Cavitation – free design
- Closed loop control hydraulics
- Full port internal diameter for line shaft pumps
- Adjustable speed throttling
- Custom injection port design
- Can be used for well-development cycle
- Compact valve size and weight
- Maintains precise flow set-point
- Energy efficient - low head loss during recovery pumping
- No expendable gas cylinders
- No confined space entry requirements
- No wear-prone rubber bladders
- Position indication
- NSF-61 compliant materials
- Material certs to meet AIS and FAR requirements
- Manufactured in the USA
- HPU's fabricated in UL-508 panel shop
- Allen Bradley CompactLogix PLC communication

V-Smart BIC-V™ Well Protection Operation

- Prevents entrained air which can air bind the well, limiting injection capacity and clogging the well

There are key issues that arise when air is entrained in cascading water. When injection flow rates are allowed to enter the well bore uncontrolled, it is possible for column separation to occur in the flow stream, pulling in air that is mixed with the water and injected into the well formations. Several well clogging events occur when this happens. Air gets trapped into the aquifer formations and binds the well, limiting injection flow rates. Minerals precipitate out of solution and form throughout the formations. Calcium carbonite is a key component that can not only clog the well but cause extreme difficulties during subsequent remediation efforts to remove the solidified crystal growth. Dissolved oxygen is introduced into the well, providing increase breeding conditions for naturally occurring bacteria. Even on those wells where injection rates are expected to be consistent, non-adjusted, and long term, air entrainment is induced with every start and stop of the injection cycle. In addition, injection flow rates have to be at a constant volume with constant injection pressure to maintain a full column pipe, when a valve is not utilized. Any changes in the injection pressure or volume available for injection, causes the flow rate to differ from the rate expected to be achieved with a fixed effective orifice area.

- Limits injection flow rate to maximum allowed set point to protect the well construction.

Injection flow rates need to be limited to protect the well construction and gravel pack against excessive velocity. The V-Smart BIC-V™ valve can limit injection flow rates so that the well will not experience a damaging flow volume or velocity beyond a calculated maximum value. Even when a well is capable of receiving higher than designed injection flow rates, that does not equate to a safe sustainable flow rate for the well construction methods used.

- Maintains precise injection flow rate at desired gpm.

The V-Smart BIC-V™ valve allows the system to operate at precisely the injection flow rate desired. The valve can operate to allow flow rates up to the maximum determined injection rate and modulate to control flow to a set point or range that corresponds to the available delivery volume, while maintaining safe operating pressures in the well column and at the well head.

V-Smart BIC-V™ Well Protection Operation

- Maintains wellhead injection pressure at or above a minimum set point.

The V-Smart BIC-V™ valve modulates to maintain wellhead injection pressure if drops to a minimum set point at the desired flow rate. Flow rate becomes secondary in the control logic to allow for the primary control variable of well head pressure to be maintained at a safe set point above atmospheric.

- Balances injection flow rates when multiple wells are injecting off a common header

Multiple wells means a dynamic injection and backwash operation sequence. With multiple wells, the individual wells are splitting the total injection volume between all wells on the system. Some wells may be injecting while others are backflush pumping. The V-Smart BIC-V™ valve allows each well to operate at flow rates split evenly between each well or with a hierarchy of demand based on which well is the lead well versus other wells being lag wells. This lead/lag arrangement allows one well to operate at full capacity while the other well or wells operate at lower than maximum capacities. The lead well can operate in a steady consistent flow rate, while the secondary wells modulate to inject the remaining volume available. This allows a maximum injection rate across multiple wells without the risk of dropping injection pressure below atmospheric and entraining air. At set durations the lead/ lag settings can change so that over time, each well regularly assumes the lead well status and priority.

- Allows injection cycle to start with a full column pipe.

A slow opening V-Smart BIC-V™ valve insures that the control software is able to monitor system performance to prevent excess injection capacity from becoming rapidly available, which could cause a possible surge into the well bore. Linear port characterization means that for a given change in valve position, a proportional change in flow rate can be expected. A linear increase in flow volume over valve stroke allows for a predictable set point in the control software. This operation assures a full column pipe at all flow rates, eliminating the cascading water effect from over capacity.

- Slowly opens to gradually introduce the injection flow stream.

A slow opening V-Smart BIC-V™ valve further protects the well construction and formations from surges during the injection cycle. This maintains the integrity of the well, limits sanding effects and damaging gravel pack disturbance.

V-Smart BIC-V™ Well Protection Operation

- Protects recovery pumps against reverse flow through the pump bowls.

All injection through the V-Smart BIC-V™ valve is through external injection ports that divert all incoming flow volume though the ports and into the annulus space between the drop pipe and the well casing. In combination with a foot valve, the V-Smart BIC-V™ valve throttles to control the flow into the well through the valve injection ports.

- Maintains an adjustable back pressure in the injection column pipe to keep it full at all times.

Regardless of flow rate changes or dynamic water level in the well, the V-Smart BIC-V™ valve is capable of throttling to always maintain injection pressure at the wellhead a levels at or above the software designated minimum set point. While the primary control variable may be flow, minimum pressure set-points will always override flow set points to assure positive column pipe pressure to surface level.

- Prevents water level rise in the well bore above a minimum depth to water set point.

Variations in well performance and injection capacity will mean every well will have an injection flow rate, beyond which water level will start to rise in the well bore. If left unchanged, the water level will rise to the surface and flood at the well head unless the well construction is with a pressured casing. Some ground water injection permits limit water level rise to a specific minimum depth to water. The V-Smart BIC-V™ valve is able to modulate flow to limit the injection rate such that water level rise in the well does not exceed a maximum dynamic injection water level.

- Allows for a completely adjustable injection flow rate set point.

An adjustable flow rate is available over the full stroke of the V-Smart BIC-V™ valve. This allows the valve to handle a wide range of flow rates, from the minimum operational rate, up to the predicted maximum flow rate. Regardless of changes in injection pressure or dynamic water levels, the V-Smart BIC-V™ valve can throttle over the full stroke range to maintain flow rates while protecting against column pressure drops or water level rises outside of the dead-band set zone.

V-Smart BIC-V™ Valve Applications

Aquifer Storage and Recovery

The term Aquifer Storage and Recovery, or ASR, predominantly applies to municipal production wells that are set up for dual purpose, injection and pumping operation. The primary function of these wells is to supply potable water to a community. The secondary purpose is to allow treated water, meeting local and state regulations for potable water, to be injected back into the aquifer for extraction at a later date. Groundwater is replenished in times of surplus supply to allow for extraction at a later date.

Reclaimed Waste Water Recharge

Rather than discharging treated effluent downstream of a treatment plant, local groundwater can be replenished by injecting effluent, treated to drinking water standards, back into the aquifer. Typically injection and extraction points differ in these applications so there is retention in the aquifer for a period of time before extraction, so that there is not a direct, immediate link to the extracted water coming immediately from the injection point.

Sea Water Barrier

This typically utilizes the same waste water disposal techniques but in specific locations along the coastline to establish a "curtain effect" along the coast to prevent groundwater extraction from pulling in seawater due to over pumping. The injected water forms a "mound" or area of higher pressure to form a barrier between the fresh water aquifer and migrating water with higher salinity.

Brine Disposal

During desalination of water through reverse osmosis, there is a brine waste stream that must be properly disposed. Typically, regulations prevent surface discharge and limit or prohibit the amount and/or locations that this brine can be disposed into the ocean. A brine disposal well injects this high saline content water into deeper aquifers or other brackish water aquifers that are not used for drinking water supply.

V-Smart BIC-V™ Valve Applications

Ground Water Remediation

Contaminated groundwater is extracted from an identified plume and delivered for a specific treatment process based on the contaminates that need to be removed. Generally the extraction wells are located on the most hydraulically down-gradient boundary of the contaminant plume. The injection wells are typically separate wells, located on the most hydraulically up-gradient boundary of the plume. Once treated, the water is re-injected back into the aquifer, through the V-Smart BIC-V™ valve in a continuous pump/treat/inject process to slowly bring the contaminated aquifer back into safe water quality standards. Most of these wells are equipped with submersible pumps to allow for back-flushing of the injection well after a predetermined length of time to remove any clogging mechanisms that can degrade the injection performance of the wells.

Aquifer Thermal Energy Storage (ATES)

ATES is an fairly recent geothermal technology for the seasonal storage of cold and/or warm groundwater in an aquifer for recovery of thermal energy in the subsurface. ATES is applied to provide heating and cooling to buildings or other industrial facilities such as power generation or manufacturing plants. The operation of an ATES system uses the aquifer to temporarily store the process water to handle some or all of the site heating and cooling demand. The V-Smart BIC-V Borehole Injection Control Valve™ is utilized on these wells to control flow into the aquifer in similar fashion to other aquifer storage and recovery applications to control the injection flow rate to designed rates, preventing air entrainment and well clogging, while controlling water level rise in the well bore.

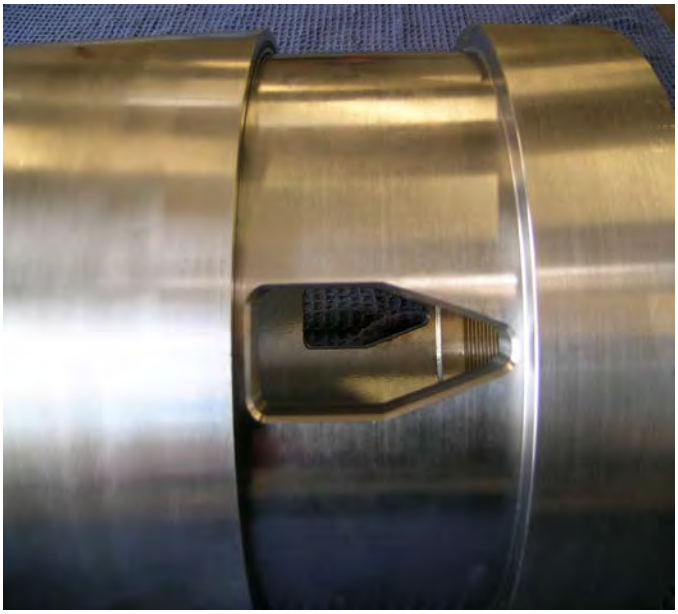
Vadose Zone Injection

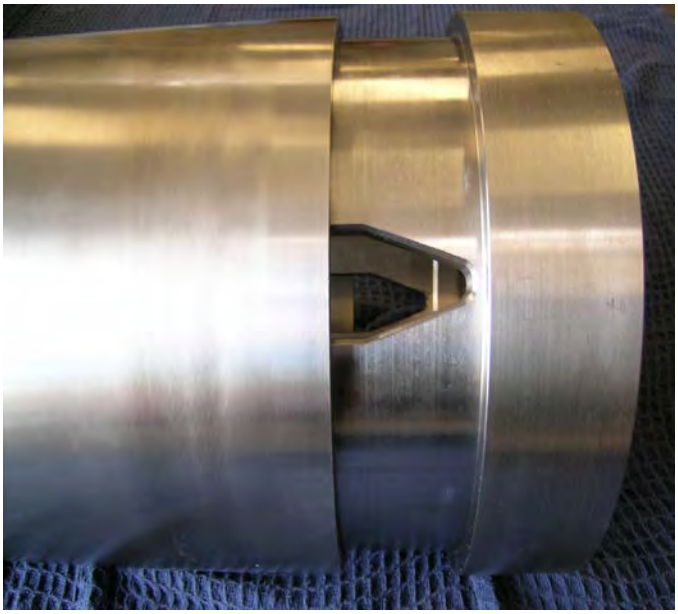
The vadose or “shallow” zone is the unsaturated portion of the subsurface that lies above the saturated zone also know as the groundwater table or aquifer. This vadose zone is located above the aquifer and extends all the way up to the surface. The V-Smart BIC-V Borehole Injection Control Valve™ plays a key role in the effectiveness of these vadose zone wells. Although vadose zone wells are typically considerably less expensive to install, they can also experience clogging events that are more difficult to correct. Since vadose zone wells do not have backwash pumps installed, protecting the well against clogging becomes critically important. Injection flow rates are typically less than those of similar size, saturated zone injection wells.

GALLERY

GALLERY


HYDR PUMP RUNNING
VALVE OPENED
VALVE CLOSED
POWER ON
OFF HAND AUTO
OPEN VALVE
CLOSE VALVE
START HYDR PUMP
STOP HYDR PUMP





CONTACT US

ASR RESOURCES

www.asrresources.com

*to request a quote, please visit our website/Contact-us/ and fill out the request form

www.facebook.com/asrresources

www.linkedin.com/company/asr-resources-llc

www.youtube.com/Aquifer Storage and Recovery

www.instagram/ASR-RESOURCES

(702) 674-9333

7345 S Durango Dr., STE B107-176
Las Vegas, NV 89113

rob@asrresources.com