

Downhole Flow Control Valves Operation and Applications

BASNI

Presented by
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Baski Flow Control Valves

Background

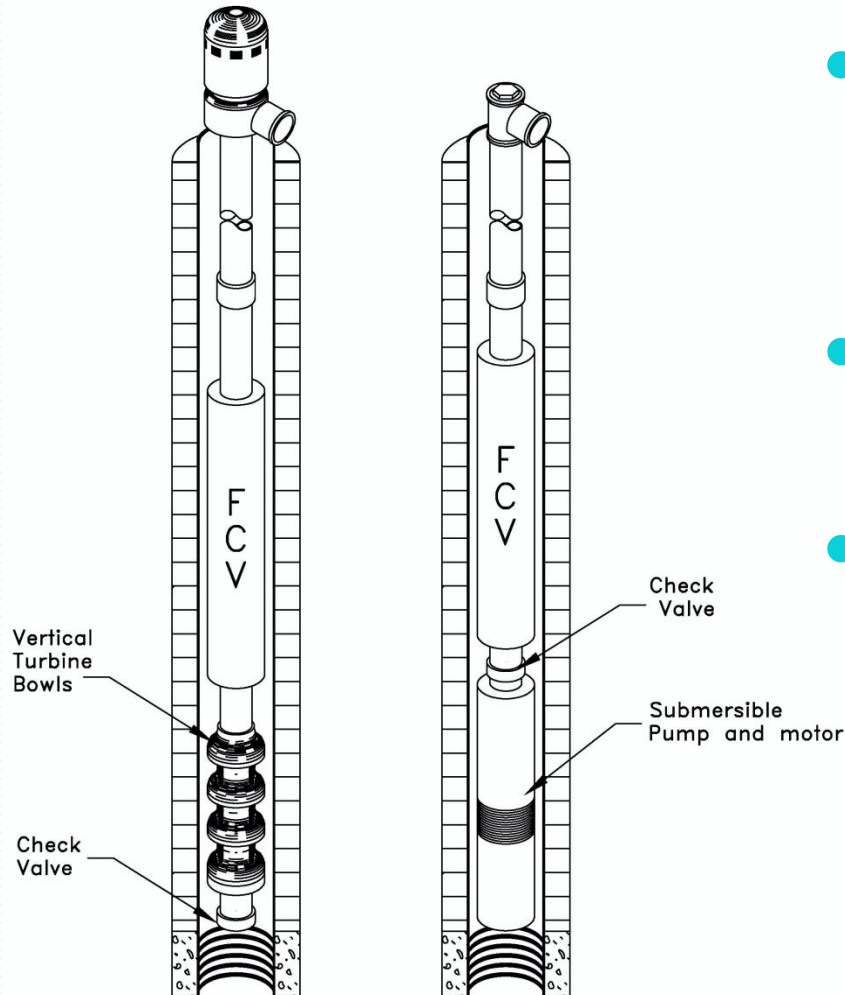
- Baski manufactured the world's first downhole ASR valve in 1992, installed in Highlands Ranch, Colorado for Centennial Water and Sanitation District.
- To date, over 260 Baski FCVs have been manufactured and installed.
- Most Installations in the Western United States and Canada.



What are FCVs used for?

- Inject and pump water using the same column pipe
- Accurately control injection rates anywhere from drip tight to full flow
- Keeps the column pipe full of water at all times
- Prevents cascading water and air entrainment
- Injection water doesn't flow back through the pump

Typical Downhole Arrangements



- Can be used with submersible or vertical turbine pumps
- Check valve must be placed below the FCV
- Can be placed in screen or blank casing, because the direction of discharge is parallel to the column pipe

Centerpipe is clear all the way through



FCV in production
(rubber element not installed yet)

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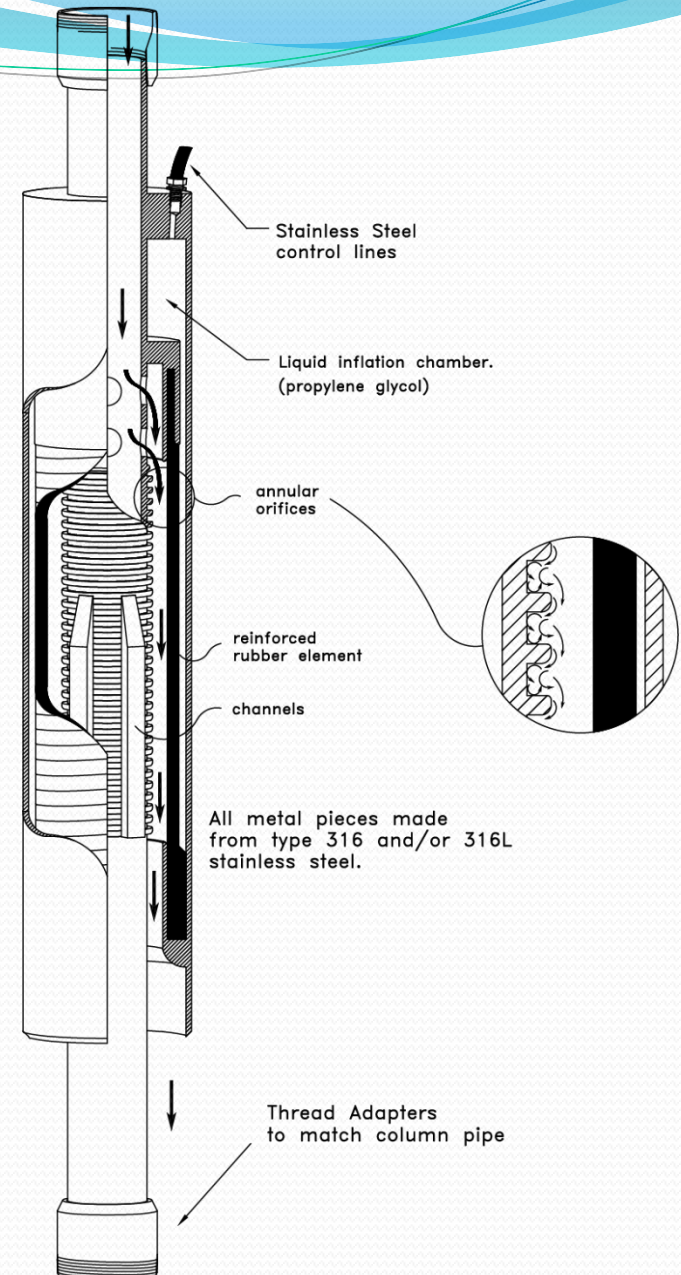
Size and Capacities

- Column Pipe sizes between 1" and 14"
- Set Depths from 40 ft to 2,500 ft bgs
- Driving Heads from 5 psi to 1300+ psi
- Injection Flow Rates from drip tight to 5000+ gpm

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Basic Operation

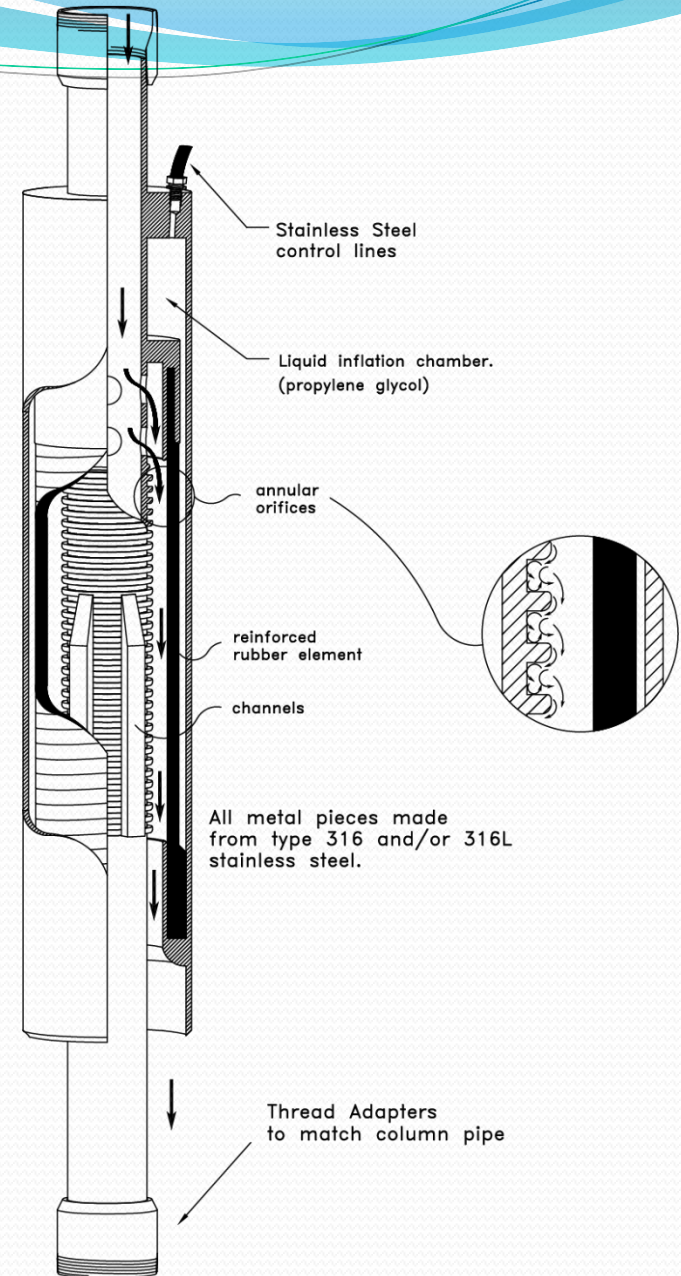
- Inflated with compressed nitrogen via $\frac{1}{4}$ " OD stainless steel tubing
- The valve is a normally open valve
 - **Increase** the pressure to reduce injection flow or close injection path during pumping
 - **Decrease** the pressure to increase flow during injection



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Basic Operation

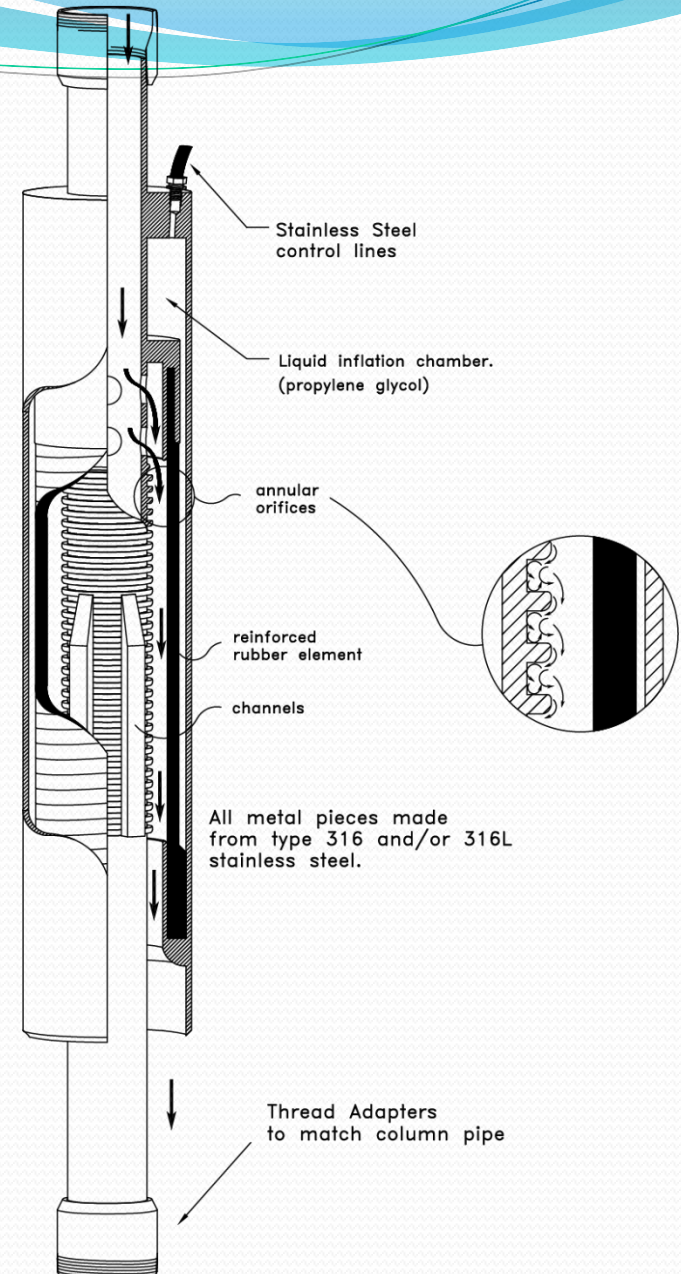
- During pumping, the FCV is inflated to the predetermined shutoff pressure
 - By inflating to the shutoff pressure, the injection path is closed off, yet the centerpipe remains open for pumping
 - During pumping, the FCV acts like a 10 ft length of column pipe



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Basic Operation

- During injection, the FCV inflation pressure is reduced below the shutoff pressure, thereby opening the injection path.
- The FCV pressure is reduced until the desired injection flow rate is attained.
- To stop injection, the pressure is increased to the shutoff pressure.



FCV Control Panel

- Allows for manual or automatic operation by integrating with existing SCADA system
- Can be operated manually without power
- Includes built in pressure relief valves to prevent over-pressurization
- Allows for additional pressure transmitters to be installed for SCADA feedback



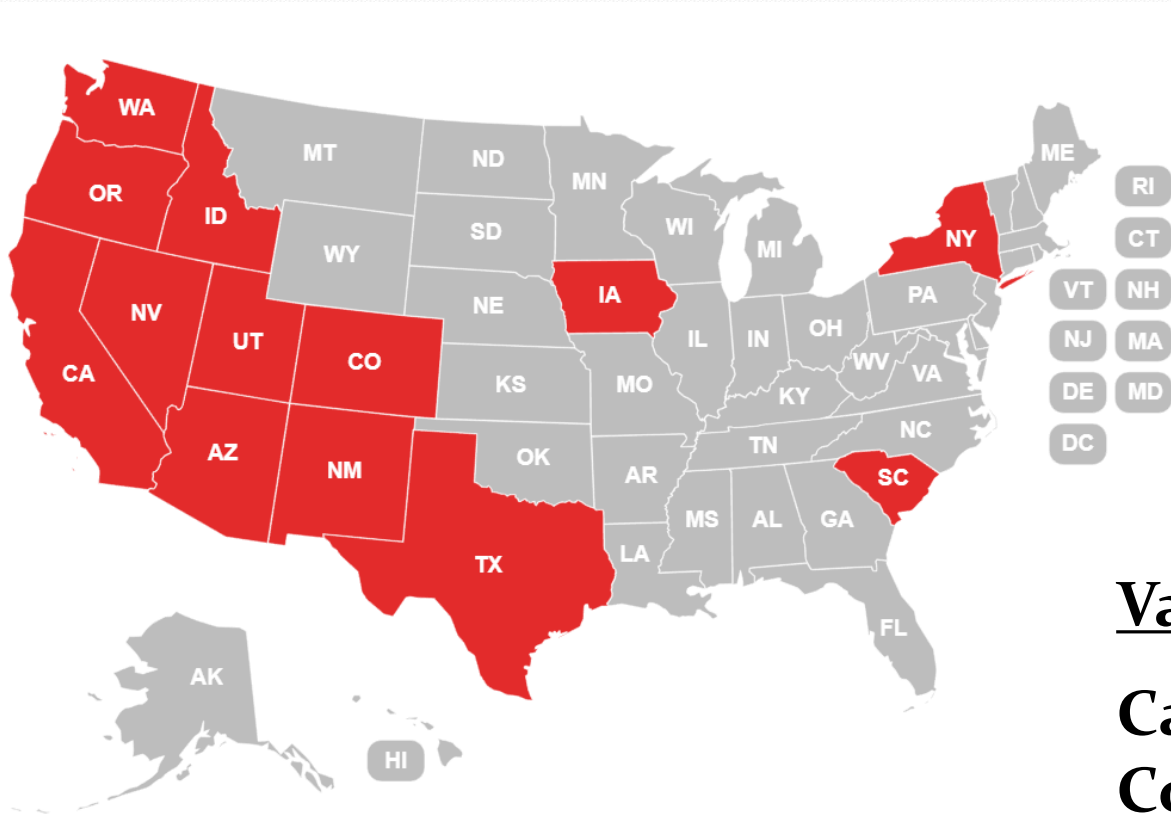
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Applications

- 190+ FCVs installed in Aquifer Storage and Recovery Wells
- 29 FCVs in Groundwater Remediation Projects
- 25 FCVs in Seawater Barrier Applications
- 5 FCVs in Geothermal Wells

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Applications



Valves by State:

California- 73

Colorado- 52

Arizona- 51

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Applications

Aquifer Storage and Recovery/Managed Aquifer Recharge

- Most common application Baski FCVs have been used in
- Direct Injection wells, typically with water levels greater than 30 ft from surface
- Can retro-fit existing production wells for ASR use

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Applications

Groundwater Remediation Projects

- Most common is Pump, Treat, Re-inject
- In situ Remediation- Injection of water with reagents directly into affected formation
- Injection as a method to create a hydro barrier around a plume of contamination

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Applications

Sea Water Barrier

- Large scale operation in Orange County California
- Prevents salt water intrusion of fresh water basin
- Constant injection in dozens of wells creates hydraulic barrier
- Traditional ASR wells installed within the basin as well

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Injection Operations

Injection Strategies and Goals

- Maintain a specific flowrate
 - Most common approach in ASR wells, mainly due to water rights and availability of source water
- Maintain a specific pipeline pressure at the surface
 - Used in some well fields with several injection wells, and also geothermal systems
- Maintain a specific water level in the well
 - Used with seawater barriers, also remediation

Questions?

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