CLA-VAL®

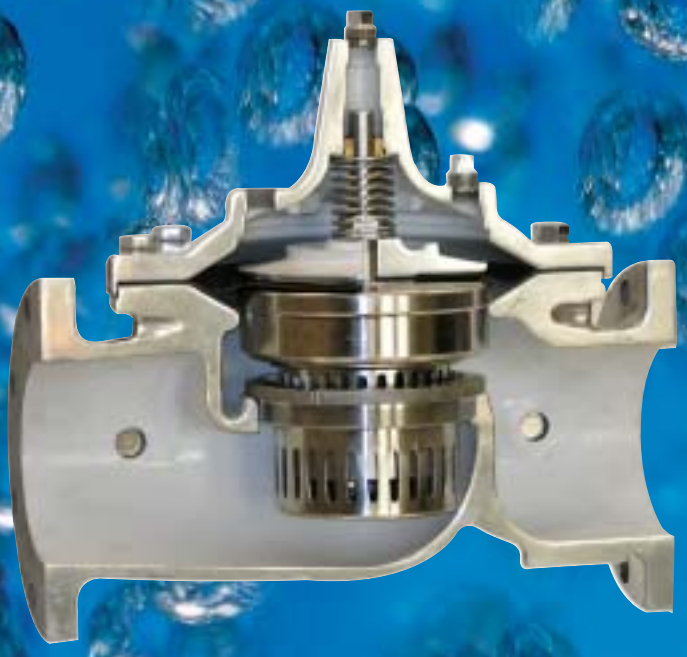
Cavitation Solutions

The Cavitation Challenge

CLA-CAV Cavitation Software

KO Anti-Cavitation Trim

Anti-Cavitation Control Valves



Model 100-01KO
Anti-Cavitation Hytrol Valve

The Cavitation Challenge

When subjected to high-pressure differentials or high flow rates, valves often exhibit excessive noise and vibration. This is usually attributable to the phenomenon of cavitation, which can range from relatively harmless levels called incipient cavitation to significantly more acute levels that actually damage valves and related piping. Over extended periods of time, noise levels can even cause hearing loss in plant personnel.

Cavitation occurs when the velocity of the fluid at the valve seating area becomes excessive, creating a sudden severe reduction in pressure that transforms the fluid into a vapor state, resulting in the formation of literally thousands of minute bubbles. The subsequent decrease in velocity and pressure rise that occurs after the valve seating area, when the pressurized condition resumes, causes these vapor bubbles to collapse at the rate of many times per second. Should this occur in close proximity to any metal surface, damage can take place. Over time, this can lead to valve failure.

The steps taken to minimize or eliminate these conditions that adversely affect operation and service life continues to be one of the most serious challenges encountered in the daily operation of a water distribution system.

Cavitation's Damaging Effects

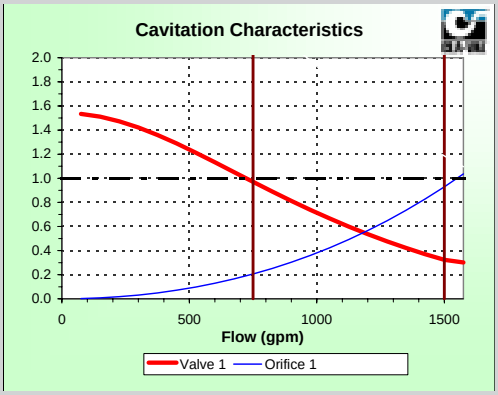
- Excessive noise
- Erosion of valve body
- Damaged internal components
- Loss of flow capacity
- Pressure fluctuations
- Diminished performance
- High maintenance costs
- Valve failure
- Costly valve replacements

Understanding Cavitation and How to Fight It

CLA-VAL Cavitation Analysis Software

Understanding the circumstances under which cavitation noise and damage occurs in valves is critical to effectively operating and maintaining water distribution systems, particularly in those with high capacity operating requirements. To help achieve this understanding, CLA-VAL offers Specifying Engineers and Maintenance Personnel a complete analysis of their distribution systems, utilizing our own in-house, state-of-the-art cavitation analysis software -- CLA-CAV.

CLA-CAV analyzes physical characteristics and operating conditions provided by a system designer or operator and models the performance of CLA-VAL valves under those conditions to create a computerized snap-shot of the potential for cavitation noise and damage. Using valve size, maximum and minimum flow rate, static/dynamic inlet and outlet pressure, water temperature and elevation above sea level, CLA-CAV can accurately predict if and when a valve will experience critical, damaging or choking cavitation.



The CLA-CAV Advantage:

- CLA-CAV identifies when damaging cavitation will occur in addition to the onset of critical cavitation.
- CLA-CAV helps to identify which valve or equipment combination will be the most effective means to eliminate potential cavitation damage.
- CLA-CAV helps to lower system maintenance costs by predicting cavitation damage before it happens.

Armed with this data, our application specialists can advise which valve or valve combination will be best suited to handle a given system's flow control requirements. In many cases, a valve equipped with CLA-VAL's anti-cavitation trim will be the preferred method to eliminate the potential for noise and damage. In other scenarios, CLA-VAL's experts may recommend that a valve/orifice plate combination or multiple valves installed in series would be the most cost-effective means to combat cavitation while providing optimum flow control under the system's specific operating conditions.

Utilizing the CLA-CAV cavitation analysis program is an important first step in designing a water distribution system that will withstand the extreme conditions of high pressure drops and flow rates while helping to ensure long, trouble-free operation of your control valves and the system as a whole.

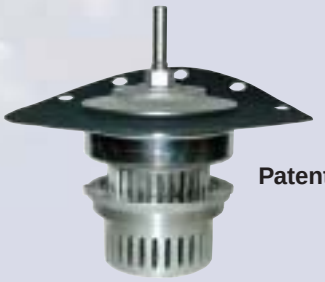
Cavitation Solutions

KO Anti-Cavitation Trim

CLA-VAL's KO Anti-Cavitation trim represents a dramatic departure from the standard approaches usually employed to fight cavitation in valves that are required to undergo extreme pressure differentials and high velocity flow conditions.

Constructed of 316 Stainless Steel, the seat and disc guide feature dual interlocked sleeves containing cast radial slots that deflect internal flow to impinge upon itself, harmlessly dissipating potential noise and cavitation damage. The cast radial slots, for which there is a patent pending, create a larger flow path than is possible with the standard drilled holes typically employed by other anti-cavitation valves currently available in the market place. The uniquely designed radial slots in the seat and disc guides also lessen the possibility of fouling if small particles are present in the water.

Valves equipped with CLA-VAL's KO Anti-Cavitation trim provide optimum internal pressure control while virtually eliminating noise and damage associated with cavitation.



Patent Pending

Cavitation Solutions

- Erosion of valve body and internal trim is eliminated
- Significant noise reduction
- Uniquely designed seat and disc guides
- Retrofittable without removal from the line

CLA-VAL Anti-Cavitation Control Valves

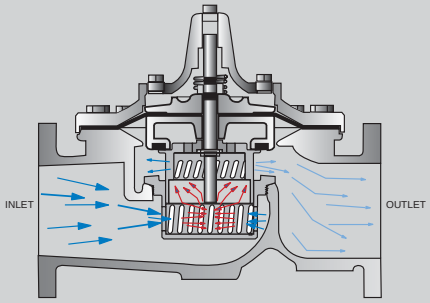
CLA-VAL models currently available with KO Anti-Cavitation Trim include the single chambered Hytrol type valve and the dual chambered Powertrol type valve. Depending on what has been determined to be most effective from an operational and budgetary standpoint, other valve combinations can also be employed to combat the potential for cavitation.

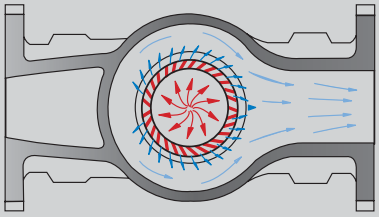
Model 100-01KO Hytrol Control Valve

The Model 100-01KO Hytrol valve is an ideal choice for a wide variety of control valve applications having pressure differentials up to 300 psid for remote control, pressure regulation, solenoid operation, rate of flow control or liquid level control. The Hytrol 100-01KO is a hydraulically operated, diaphragm actuated globe pattern valve that may also be specified in a relief valve application with atmospheric discharge up to 150 PSID. Consult Factory for operating conditions outside these parameters.

The KO Anti-Cavitation Trim Advantage:

- Virtually cavitation free operation
- Reduced noise and vibration
- May be retrofitted to existing valves
- Serviceable without removal of the valve from the pipeline
- 316 Stainless Steel seat and disc guide
- Drip-tight, positive sealing





CLA-VAL Anti-Cavitation Operation

First Stage Pressure Reduction

- Flow enters through seat slots and reduces pressure

Second Stage Pressure Reduction

- Flow impinges upon itself within the seat and disc guide assembly to dissipate cavitation and further reduce pressure

Third Stage Pressure Reduction

- Flow exits through disc guide for final pressure reduction
- Diagonal disc guide slots direct flow away from surfaces

CLA-VAL innovations -- Destined to become tomorrow's standards.

Since 1936, CLA-VAL has produced the world's highest quality automatic control valves for a diverse array of market places. Over the years, we have designed and manufactured products that have eventually become the standard in their industries.

In waterworks applications, CLA-VAL's automatic control valves meet the demanding requirements of distribution systems with accuracy and dependability. Special focus is placed on ensuring that our products exceed all applicable standards and specifications prescribed by the industry, including AWWA, FDA, NSF61 and WRAS requirements.

CLA-VAL innovative electronic interface control valves have set the standard for efficiency in hydraulic control with advanced technology electronics to provide the optimum SCADA remote control solution.

Our waterworks product line also includes air valves that are designed for working pressures to 800 psi and manufactured to meet ANSI-AWWA C512-92 standards. Together with our check valves and foot valves, they work overtime to protect your system in the most demanding of applications.

No matter how complex the system or severe the operating conditions, CLA-VAL automatic control valves perform with precision and reliability to provide exact control of pressure, flow, level, surge and pump control.

CLA-VAL's family of fine products also includes:

- Fire Protection Valves
- Valves for Marine Applications
- Valves and associated products for Aviation Ground Fueling
- Wastewater Valves
- Specialty Valves

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