



Cla-Tools

Software Solutions



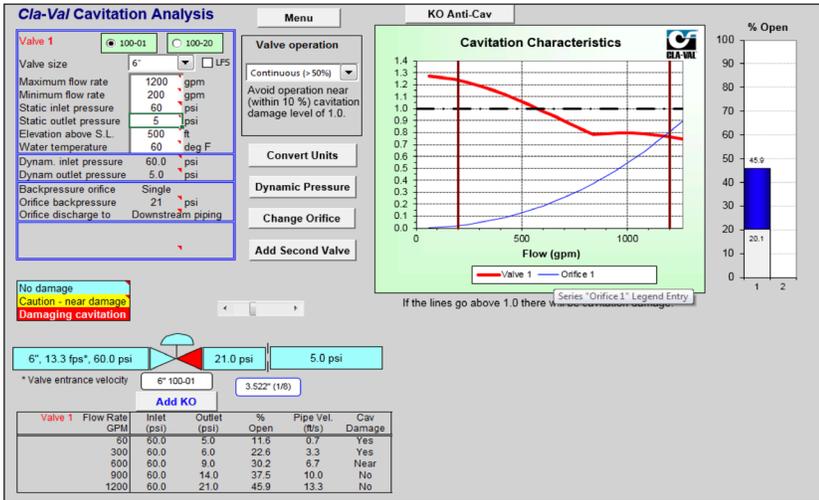
VFD PUMP FLOW | PRV STATIONS | CHECK VALVES | CAVITATION ANALYSIS

Table of Contents

	Cla-CAV	3
	Cla-Station	4-5
	Cla-Power	6
	Cla-Blend	6
	Cla-REG	7
	ComparFlow	8
	Pump ComparFlow	8
	VFD ComparFlow	9
	Cla-Fire	10
	Cla-Fire ADJ	10
	Cla-Check	11
	Cla-Quick	11
	Cla-Relief	12
	CV Rubber Flex	13
	CV RF-DBI-LH	13
	Cla-AV	14

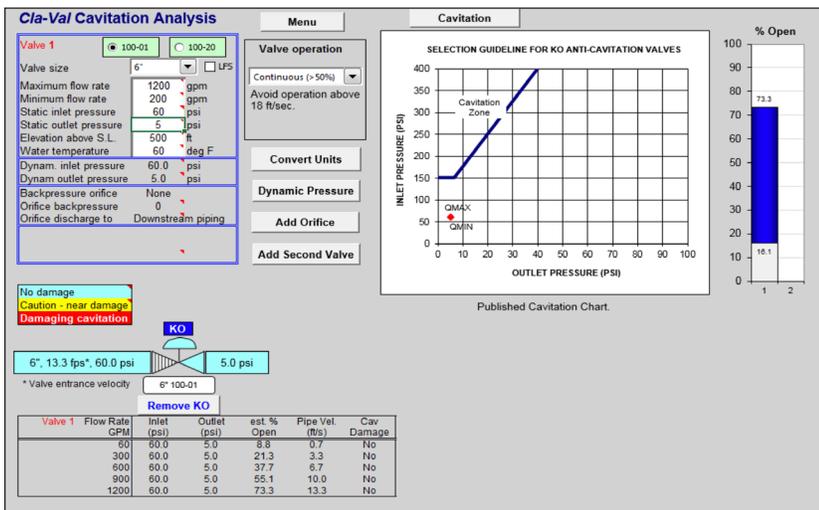


Cla-CAV is a tool for analyzing pilot operated control valves for the potential of cavitation and cavitation damage at the full range of flows and pressures, allowing the designer to see the benefits of adding KO anti-cavitation trim.



Cla-CAV 1

This screen illustrates that with a wide range of flows a back pressure orifice will not provide cavitation damage protection in the lower portion of the flow range. However when the range of flows is narrow, such as fixed flow control into a tank, this may be an economical alternative. Cla-CAV incorporates capabilities to analyze both backpressure and metering flow control orifices. Much of the results are based on independent lab tests at the Utah Water Research Laboratory.



Cla-CAV 2

In the case above the use of KO anti-cavitation trim provides cavitation damage protection over the entire range of flows. It also illustrates the increased portion of the valve stroke required and that in this case there is sufficient capacity with the same size valve.



Cla-Val

Valve Hydrodynamic Noise Calculation Results

IEC 60534-8-4: 2015 standard - Hydrodynamic Noise

Return

Print Valve Noise

Valve Size and Model **6" 100-01**

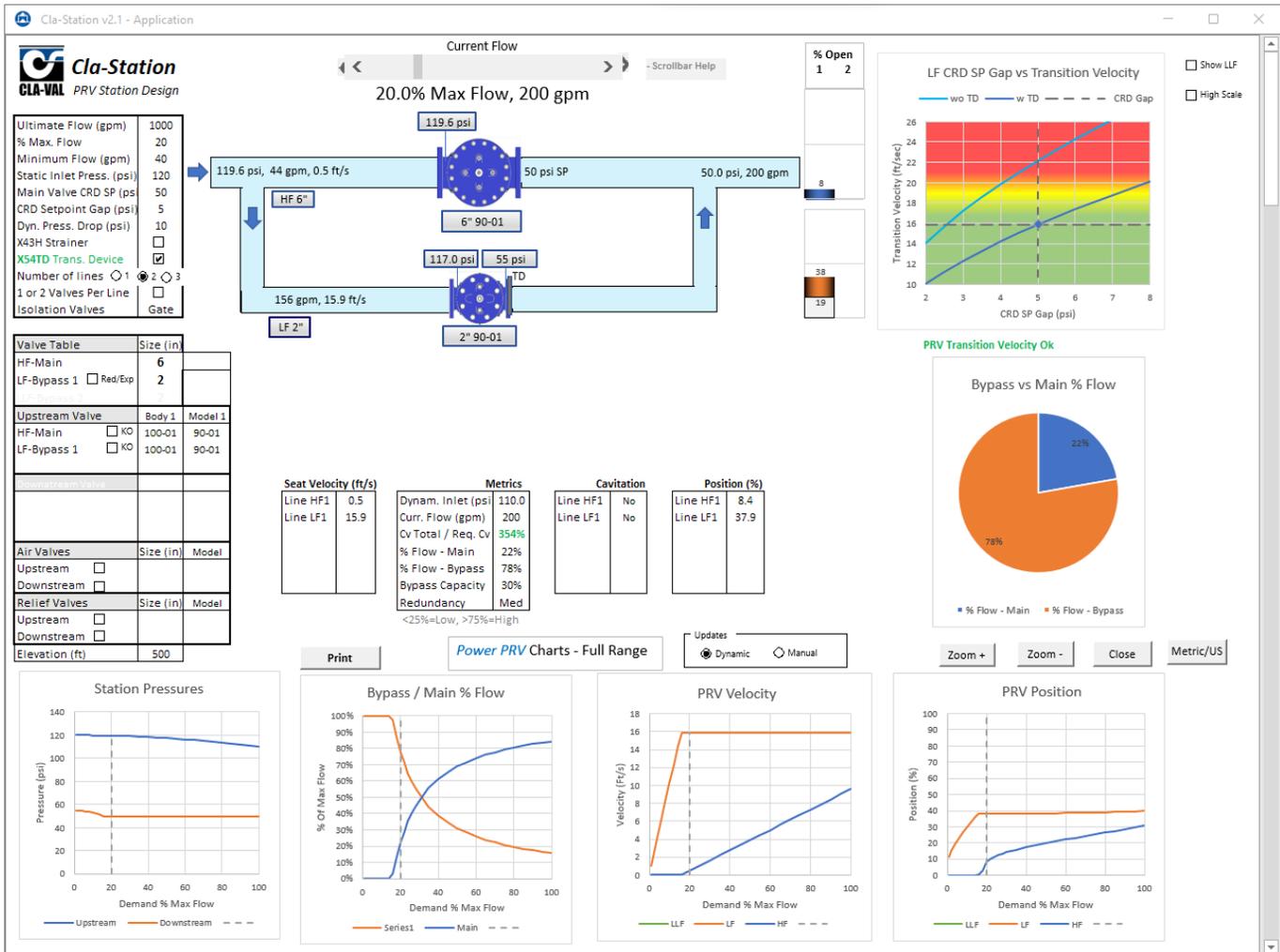
Parameter	units	Flow @ Minimum	Flow @ 25% Max	Flow @ 50% Max	Flow @ Maximum
Flow	gpm	500	250	500	1000
Inlet Pressure (absolute)	psia	72.0	73.8	72.0	64.5
Pressure Drop	psi	55.5	57.4	55.5	48.0
Vapor pressure	psia	0.3	0.3	0.3	0.3
Valve Opening	%	27.2	21.2	27.2	39.2
Valve inlet velocity	ft/sec	5.6	2.8	5.6	11.1
Sound pressure level*	dBA	75.9	70.4	75.9	81.7

The A-weighted external sound pressure level at 1 m distance from the downstream pipe
 * Calculations based on Schedule 40 steel pipe in a free field (+/- 3-5 dBA)

Distance from source meter

Cla-CAV - Valve Noise

In some hydraulic conditions, especially operation with high pressure drop, valve noise can be an issue in residential areas or where people are near the valves. Cla-CAV includes a section where the IEC standards for Hydrodynamic Valve Noise are used to calculate the Sound Pressure Level (SPL) at 1 meter distance in decibels on a "A" weighting scale (dBA). Engineers and customers can then determine if corrective action may be needed. The analysis page provides noise levels between the minimum and maximum flows.



Cla-Station

Cla-Station is a full featured PRV Station Hydraulic Modeling tool. It models PRV Station performance based on flow and pressure parameter inputs. These include CRD pilot setpoints, dynamic upstream pressures, and complete flow range. Up to three parallel lines with one or two valves in series can be modeled. A current demand flow scroll bar makes it easy to view performance at any specific flow demand including fire flow. Add on features include X54TD Transition Device, X143H strainers, Air Valves, and Relief Valves. All devices are included in hydraulic modeling of the PRV Station, The X54TD Transition Device aids in transitioning to the next parallel PRV at a recommended safe velocity.

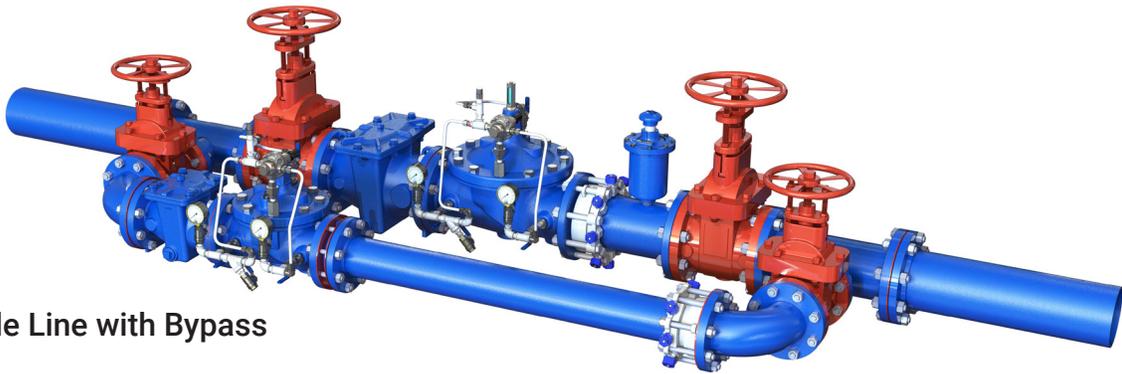
“Power PRV” charts provide performance from zero to ultimate flow of upstream and downstream pressures, relative % of total flow, velocities, and each valve position. Main Valve vs. Bypass Valves comparison chart provide a quick glance of relative performance an any specific flow demand. Multiple valve combinations can be quickly evaluated to optimize station performance. PRV Station Design can be completed by working with ESI Fab Systems for final CAD design and construction.



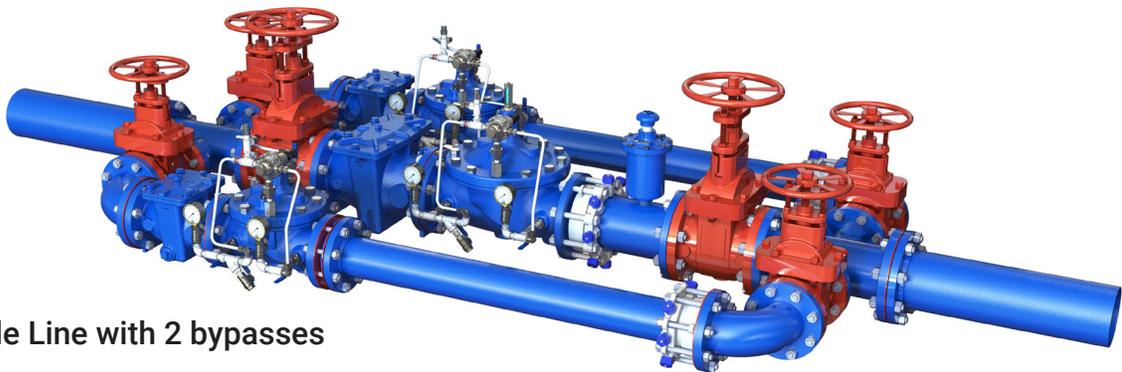
Single Line



Single Line with Bypass



Single Line with 2 bypasses





Cla-Power v1.0 - Application

Cla-Power
 To use, select a "Supply Voltage". Then select a Product from the dropdown and click "Add To Table". Enter the hours per day the device will be in use under "Run Time". The format is hh:mm (ex. either 2:00 or 0:120 for 2 hours). Devices shown in red will consume power, green will generate power. Click "Clear Table" to remove all devices from the table or "Remove Last Entry" to only remove the last row. "Print" will open the System Print Dialog Box.

Customer Info
 Customer Name:
 Project Name:
 Date:

Select Products:

Supply Voltage (VDC)

Legend
 Total xx - Generator(s) can supply system
 Total xx - Generator(s) cannot supply enough power

Devices	Power (Watts)	Run Time per day (hours:minutes)	Run Time per day (minutes)	Amps at Supply Voltage	Amp-Hours
VC-22D (in use)	3.00	0:30	30	0.25000	0.125
VC-22D (standby)	1.50	23:30	1410	0.12500	2.938
CRD-34	12.00	0:05	5	1.00000	0.083
X143IP	14.00	12:00	720	1.16667	14.000
Total	2.50				10.854

Cla-Power

Cla-Power is a basic power consumption calculator that can be used with any Cla-Val electrical products. This calculator allows for all electrical products at a site, or in a vault, to be added to a table with their daily usage and supply voltage. From this, the total power draw and amp-hours of that system can be found. Cla-Val generators, like the X143IP, can be added the table along with the suspected run time in order to see if it will be capable of supporting the desired system. This is extremely useful when trying to figure out run time and needed battery capacity. The calculator is also useful in determining external DC power supply and Solar panel requirements.

Cla-Blend



Cla-Blend v1.0 - Application

Cla-Blend 1.0
 Cla-Val 20-01 Blending Design

Inputs

Maximum Total Flow	300	gpm
Maximum Softener Flow	200	gpm
System Inlet Pressure	80	psi
Minimum Blended Pressure	50	psi
Softener Loss @ Max Flow	7	psi
R1 Restriction Pipe ID	6	in

Outputs

20-01 Maximum Flow	100	gpm
Ratio 20-01 Flow/Total Flow	33.3%	
Total Available Loss	30	psi
R1 & R2 Restriction Loss	23	psi
20-01 Valve Pressure Loss	7	psi
Cv of Restriction R1	41.7	
Cv of Restriction R2	20.9	
Cv 20-01 Valve (Required)	37.8	
Flow @ 5% Accuracy	93	gpm
Flow @ 10% Accuracy	67	gpm
R1 Orifice Bore Diameter	1.492	in

Total Flow vs. Blend Accuracy

20-01 (Hytrol)

Size (in)	% Cv	Vel. (fps)
1 1/4"		
1 1/2"		
2"	70%	10.2
2 1/2"	44%	6.5
3"	33%	4.5
4"	19%	2.6
6"	9%	1.1
8"	5%	0.6

Typical Applications



Cla-Blend

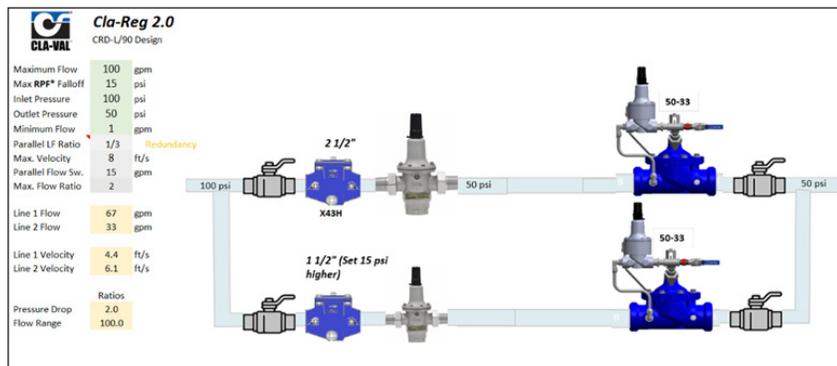
Cla-Blend is a modeling tool for soft water blending applications using the Model 20-01 Blending Valve. Results include sizes of 20-01 and restrictions given system parameters inputs. Accuracy chart illustrates the range of accurate blending performance. Diagrams show placement of the valve and restrictions in the system along with sizes.



Cla-Reg is a design tool for sizing both the CRD-L direct acting and 90 Series pilot operated pressure reducing valves for buildings, industries, and other applications. The designer inputs system requirements and the program provides recommended combinations based on those requirements. A graphical layout showing the regulator assembly including isolation valves, X43H strainers, and optional 50-33 safety valves. Well established rules for buildings are followed to prevent problems of cavitation damage and noise as well as excessive velocity. When pressure drop is too high or flow range is too wide the program automatically places valves in series and/or in parallel to perform over the entire desired flows.

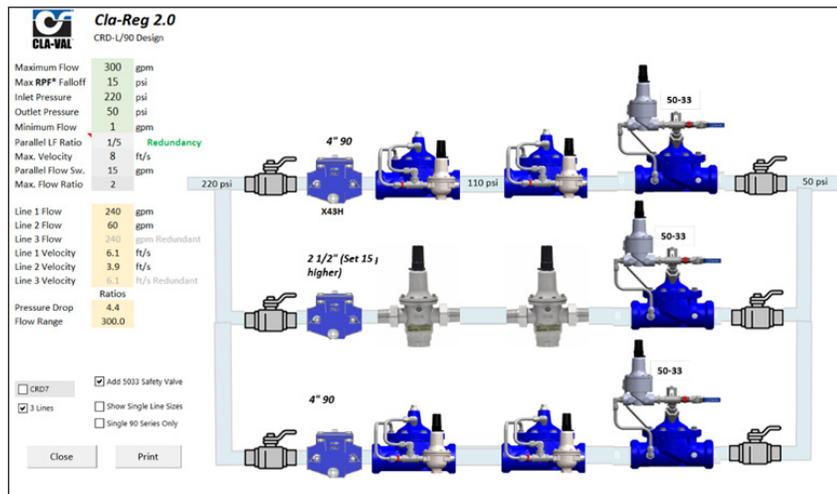
Cla-Reg 2.0 includes new features allowing up to three branch lines for extra redundancy in critical high rise building applications. A wide range of flows with up to 4 inch pilot operated 90 Series are accommodated. The program allows combinations of 90 Series and CRD-L for applications with extreme flow ranges. In addition applications with very high pressure drop will automatically recommend valves with calculated mid-pressure settings to minimize noise and cavitation. Color-coded Redundancy.

Typical Example – Combination CRD-L



Cla-Reg 2.0

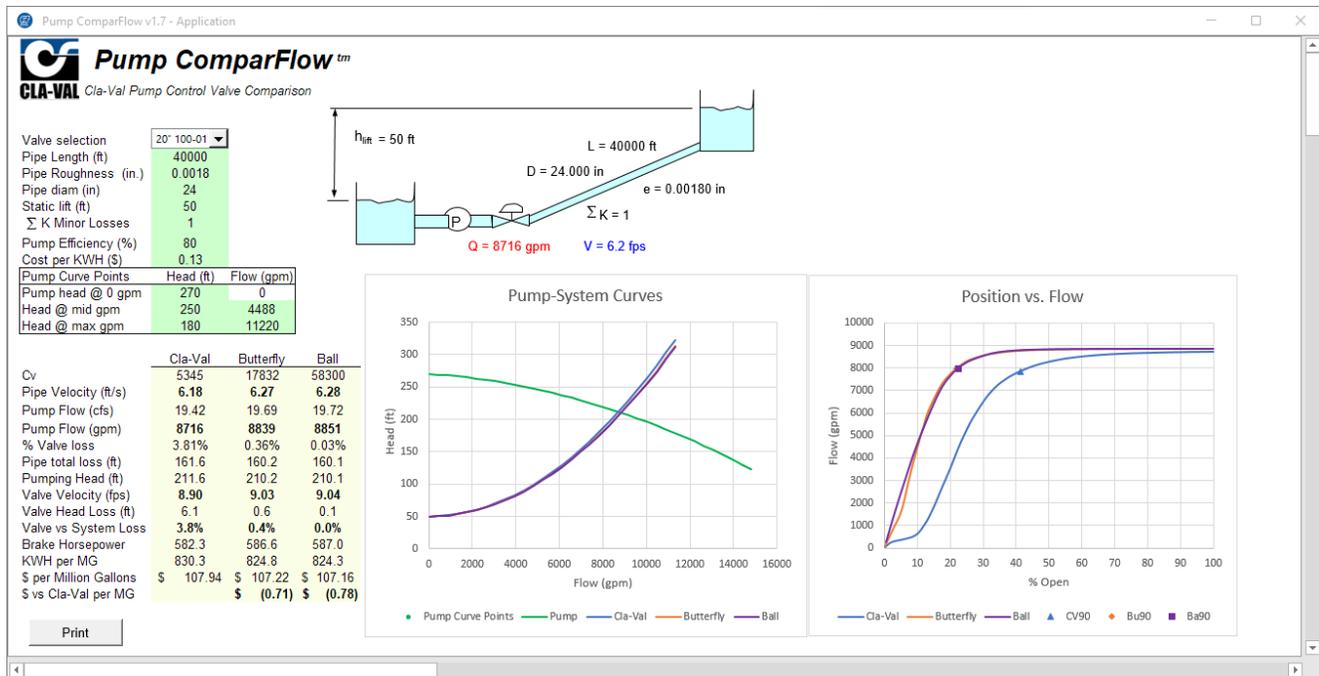
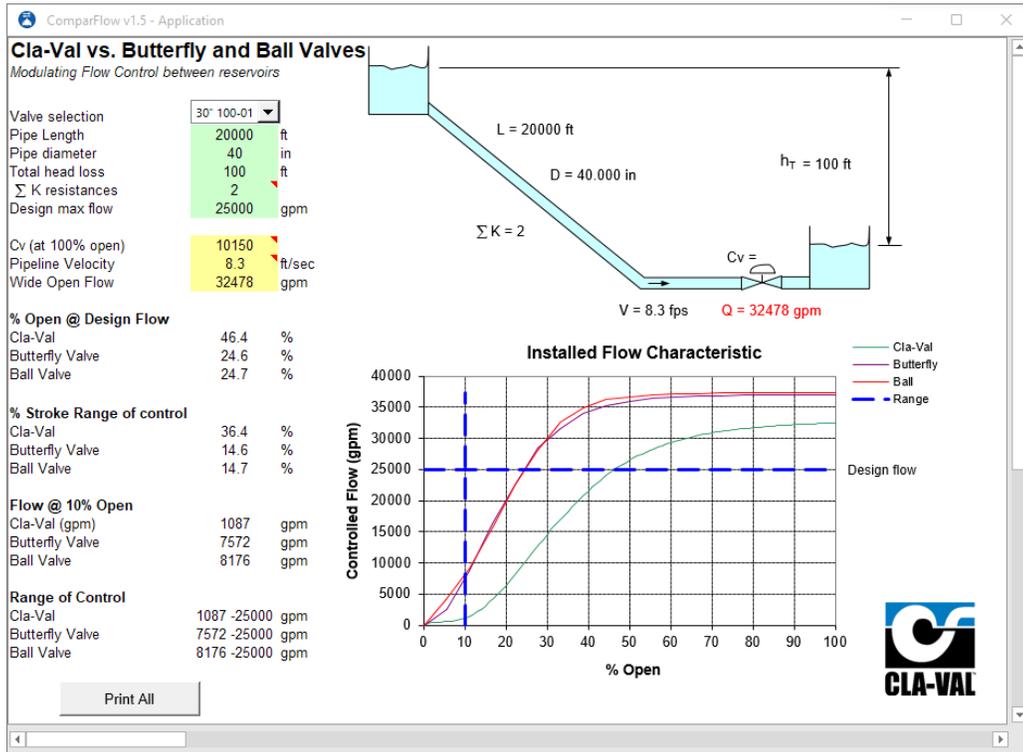
With a 2:1 pressure drop of 100 to 1 gpm the CRD-L combination of a 2 1/2" and 1 1/2" with X43H strainers and independent 50-33 Safety Valve included.

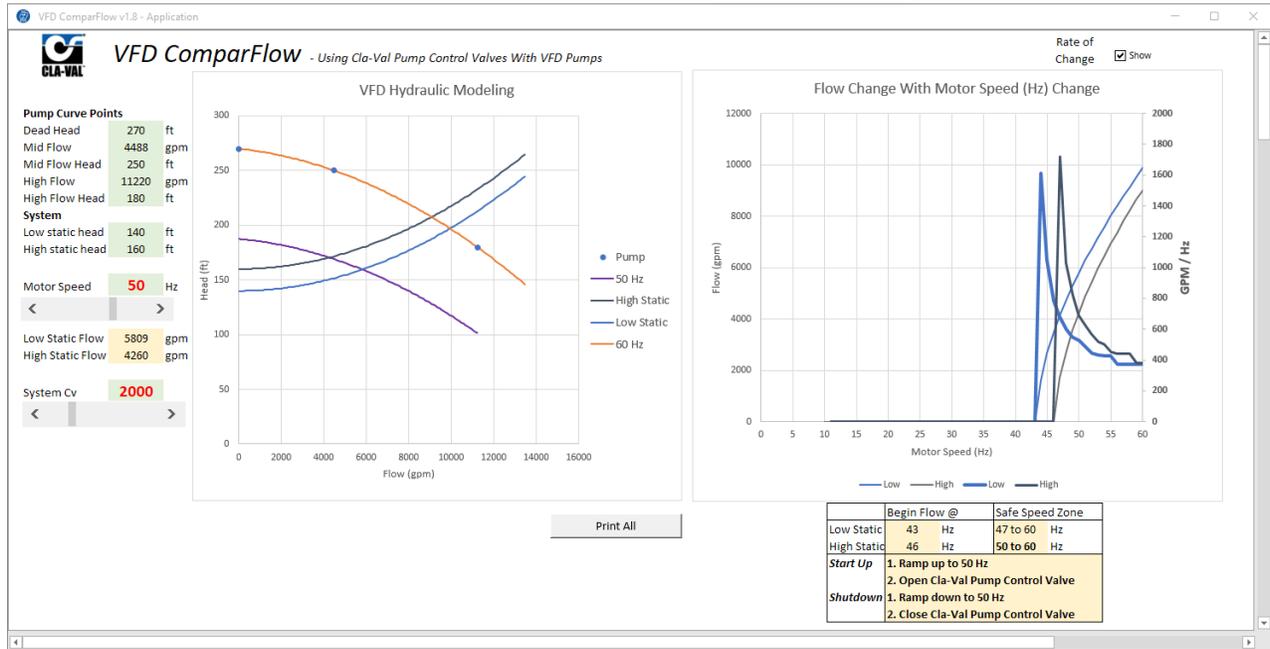


Cla-Reg 2.0

High Flow / High Pressure Drop Example With Fully Redundant Third Line.







ComparFlow

There are a trio of programs for gravity flow, pumping flow and pumping flow with VFDs focusing on valve installed “controllability” within each system. Comparisons are made vs. other “lower loss” valves such as butterfly or ball valves illustrating the improved range of control with Cla-Val globe style valves. The improved range of control results in better stability of control and reduced hazard of causing surge, especially in longer pipelines. The Pump ComparFlow program illustrates that reducing surge can be equal to or greater in importance to small energy savings with low loss type valves.

In the case where VFDs are used there is also a hazard of surges because the relationship of motor speed with flow. The program illustrates the high rate of change of flow in the low flow region which can lead to surge problems. The program illustrates how utilizing Cla-Val Pump Control Valves can limit surge and transfer control to the VFDs for modulating control.



CUSTOMER INFO

Customer Name: _____
 Project Name: _____
 Date: _____

INPUTS

Valve Size: 6 inches
 Flow: 500 gpm
 Static Pump Pressure: 0 psi
 Static Line Pressure: 80 psi

CALCULATIONS

Line Velocity: 5.67 ft/s
 Starting Valve Pos %: 64.78 %
 Pressure Drop: 1.70 psid

CHOOSE CLOSING CONFIGURATION

Pilot Line Size: 3/4 inches
 # of Return Lines: 2
 Valve Model Configuration: 81-02
 Component Configuration: 81-01
 Speed Control Configuration: None

Pressing Calculate starts an iterative procedure to find Time of Closure. *Must press after changes are made.*

Estimated Time of Closure: **0.99** seconds

VALVE INFO + Print

Cla-Check

Check Valve Analysis

Valve Position & Pressure Drop v. Velocity

Velocity (ft/s)	Valve Position (%)	Differential Pressure (DP) (psid)
5.67	64.78	1.70

Valve Position v. Time - Closing Cycle

Time (seconds)	Valve Position (%)
0.0	64.78
0.99	0

**NOTE: If pressing the "Calculate" button 2-3 times still doesn't lock in the Time of Closure, increase Max Iterations and decrease Max Change from Options -> Formulas.



Cla-Check

Cla-Check aids the user in selecting a Cla-Val Check Valve based on numerous parameters. The user can enter a Valve Size, Flow, Static Pump Pressure, and Static Line Pressure to determine Line Velocity, Valve Position, and Pressure drop through the valve. These values can be used to determine correct valve sizing for a desired flow. Once an appropriate valve has been selected, the pilot system can be configured. The number of return lines to the cover, the main valve configuration, the pilot component configuration, and speed control configuration can all be selected based on the desired closing time. These fields can all be modified in order to quickly and easily compare valves or configurations.

Cla-Quick



Cla-Quick v1.9 - Application

Cla-Quick 1.9

Max flow: 1000 gpm
 Dynamic P1: 100 psi
 Dynamic P2: 80 psi
 KO (2=Yes): 1

100-01 (Hytrol)		
Size (in)	Vel. (fps)	% Cv
6	11.3	50.8%
8	6.4	29.0%
10	4.1	18.0%

100-20 (600)		
Size (in)	Seat Vel.	% Cv
6	25.5	97.6%
8	11.3	46.6%
10	6.4	24.0%

Units Index: 1 gpm(1), cfs(2), mgd(3); 1 psi(1), ft(2)

Relief Valve: 1 (2=Yes)

Fluid Specific Gravity: 1 (Water=1, seawater=1.02, fuels<1)

Increase Size: 1 (No change(1), +1 size(2), +2 sizes(3))

Print

English Metric Ready

Cla-Quick

This software is intended to be a simple (and quick) valve sizing tool based on published information in the engineering datasheets. Suggested possible sizes are shown to meet the given flow and pressures in both full and reduced port valve models. The user can select the best option for the particular valve application. The program is compact enough to be used on both Apple and Android phones using downloadable Microsoft Excel.



Cla-Relief v1.8 - Application

Cla-Relief - Cla-Val Surge Relief Valve Sizing

Pipe Material: Steel

Pipeline size: 30 ID (in)

Wall thickness: 0.34 in

Pipeline flow: 12000 gpm

Setpoint pressure: 100 psi (atmospheric discharge)

Max allowable surge: 50 psi

Maximum seat velocity*: 40 ft/sec (*from factory datasheet)

Bulk Modulus of Water (K): 3000000 psi (300,000 psi for water)

Std. Dim. Ratio (SDR): 90.2

Wave velocity: 3369 ft/sec

Surge per 1 fps vel. change: 45.3 psi / fps

Pipeline flow velocity: 5.45 fps

Maximum possible surge: 246.7 psi

Relief valve flow: 79.7% % of normal flow

Cv required: 956.8

Pipe Mod. of Elasticity (E): 29000000 psi

Instructions
For Cla-Val Surge Relief Valve Sizer

A Surge Relief Valve is designed to open when line pressure exceeds a setpoint high pressure. If velocity changes in the main pipeline a surge is created. The maximum surge pressure that can develop depends on the velocity change, pipe material and thickness, and fluid (water).

Typical specific surge pressures for common ductile iron pipe is about 50 to 55 psi per 1 ft/sec velocity change. Other materials may vary above or below this amount. The surge wave velocity calculations will determine actual velocity and specific surge pressure.

1. Enter the main pipeline flow and dimensions.
2. Enter the mainline operating pressure and allowable maximum surge pressure. (Example Class 150lb Ductile Pipe, operating at 100 psi, allowable surge 50 psi)

The Relief valve flow required to limit system pressure is displayed on the pipe graphics. Select either of the highlighted Hytrol or 600 Series from the table of possible valves. Combinations of sizes are available in the second and third tables.

Available Relief Valve sizes (SINGLE)

100-01 (Hytrol)		100-20 (600 Series)	
10 in	38.9 vel (fps)	10 in	61.4 seat vel (fps)
12 in	27.4 vel (fps)	12 in	38.9 seat vel (fps)
14 in	22.7 vel (fps)	14 in	27.4 seat vel (fps)

Larger/Smaller Relief Valve Sizes (COMBINATION)

100-01 (Hytrol)		100-20 (600 Series)	
Larger 8" 100-01	10" 100-01	10" 100-20	8" 100-20
Smaller 6" 100-01	8" 100-01	8" 100-20	6" 100-20

Available Relief Valve Sizes (DUAL Equal Sizes)

100-01 (Hytrol)		100-20 (600 Series)	
8" 100-01	10" 100-01	10" 100-20	8" 100-20

Cla-Relief

Cla-Relief is a tool for determining optimum relief valve sizes upstream of pumps and valves. Pipeline parameters, flows and pressures are inputs to establish adequate protection from potential surges caused by stopping pumps or closing valves. Recommended sizes to sufficiently protect the pipeline are provided for full or reduced port valves. Potential surge calculations illustrate the hazards without a relief valve and the level of protection provided.



CV Rubber Flex





Cla-AV 1.0
Cla-Val 33A & 39A Air Valves

Inputs	
Pipe Diameter	24 in
Pipe Material	Steel
Wall thk > 0.120in?	Yes
Rupture % Diam	50 High

Coord.	Point	Dist. (ft)	Elev. (ft)
0	1	0	0
1000	2	1000	40
2000	3	2000	20

Outputs	
Type Of Slopes	Peak
Max. Vacuum	-2.0 psi
Slope 1	-4.0%
Slope 2	-2.0%
Rupture / Drain 1	10034 gpm
Rupture / Drain 2	7040 gpm

AV Model	
Model	33A
Capacity	% <input type="checkbox"/> Double
Size (in)	
1	
2	
3	45.7%
4	63.6%
6	102.9%
8	
10	

33A Small Cnf. (mm)	Single	076 in
	Double	076 in

Peak

6.0 in. 33A Air Flow (gpm)

Cla-AV Inputs

Cla-AV is a single air valve design tool that does much more than the traditional slide rules. There are two sections, one for air valve sizing along pipelines and the other for sizing at pump stations. At pump stations there are separate designs for Deep Well and Booster pump stations. Typical cases where air valves are used is at peaks, decreasing upslopes, increasing downslopes, and locations where drain valves or pipe ruptures require vacuum protection. The user can select either the 33A or the 39A models for sizing.

Cla-AV 1.0
Cla-Val 33A & 39A Air Valves

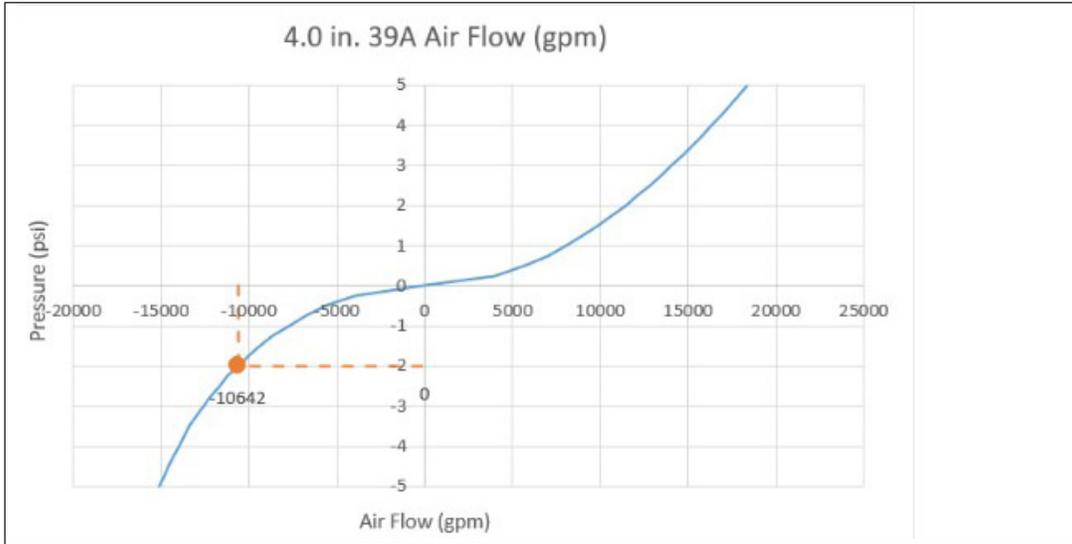
Pumping flow	2000 gpm
Venting Pressure	1 psi

Pump Station Type	Well
AV Model	33A
Size Recommended	2.0 in

2.0 in. 33A Air Flow (gpm)

Cla-AV Design

At Deep Well pump stations the 39AWS with Throttling Device or the 39C with biased restriction can be analyzed to protect against startup surge. With very large pipelines the user can choose to review designs with single or dual air valves for redundancy and installation convenience. A full range of venting and vacuum flows chart is included with each design with the operating point highlighted. The program provides an illustration from the AWWA M51 standard for illustration of where the air valves are typically located along pipelines.



Cla-AV Design 2

With the pipeline design the slope chart highlights in red the steepest slope for vacuum protection. A useful input feature allows the user to analyze different pipe rupture and drain valve size scenarios. A guideline is provided for above and below ground installations. The table output section color codes the best size and model from the design parameters given. The percent of required capacity is shown to show the user the amount of safety factor provided with the selected size. Results are based on Cla-Val's factory laboratory air valve testing.





Global Locations



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