



Software**Solutions**

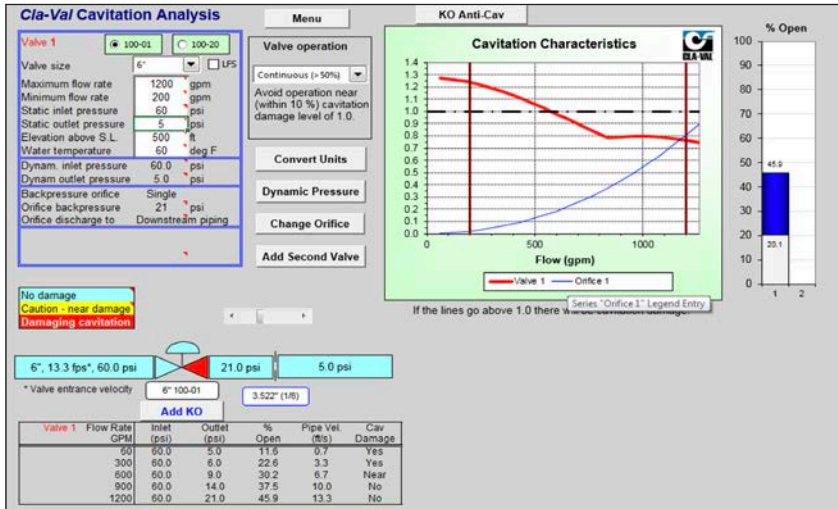
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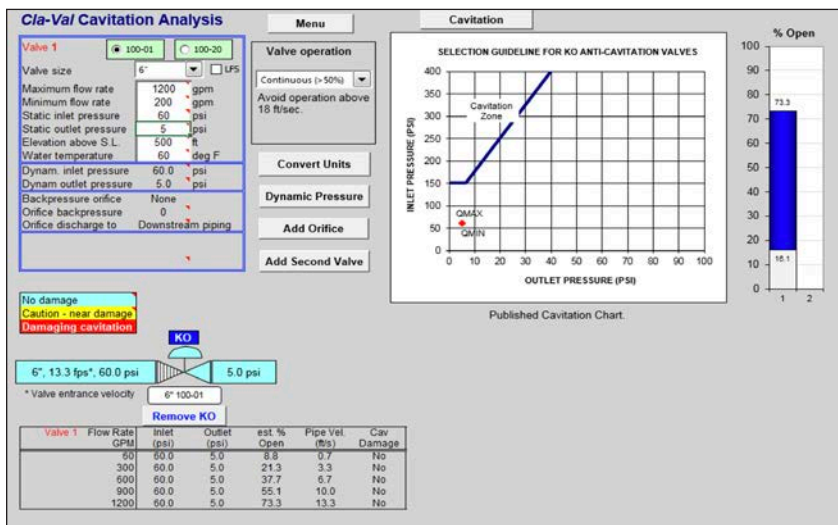
Cla-CAV

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

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)

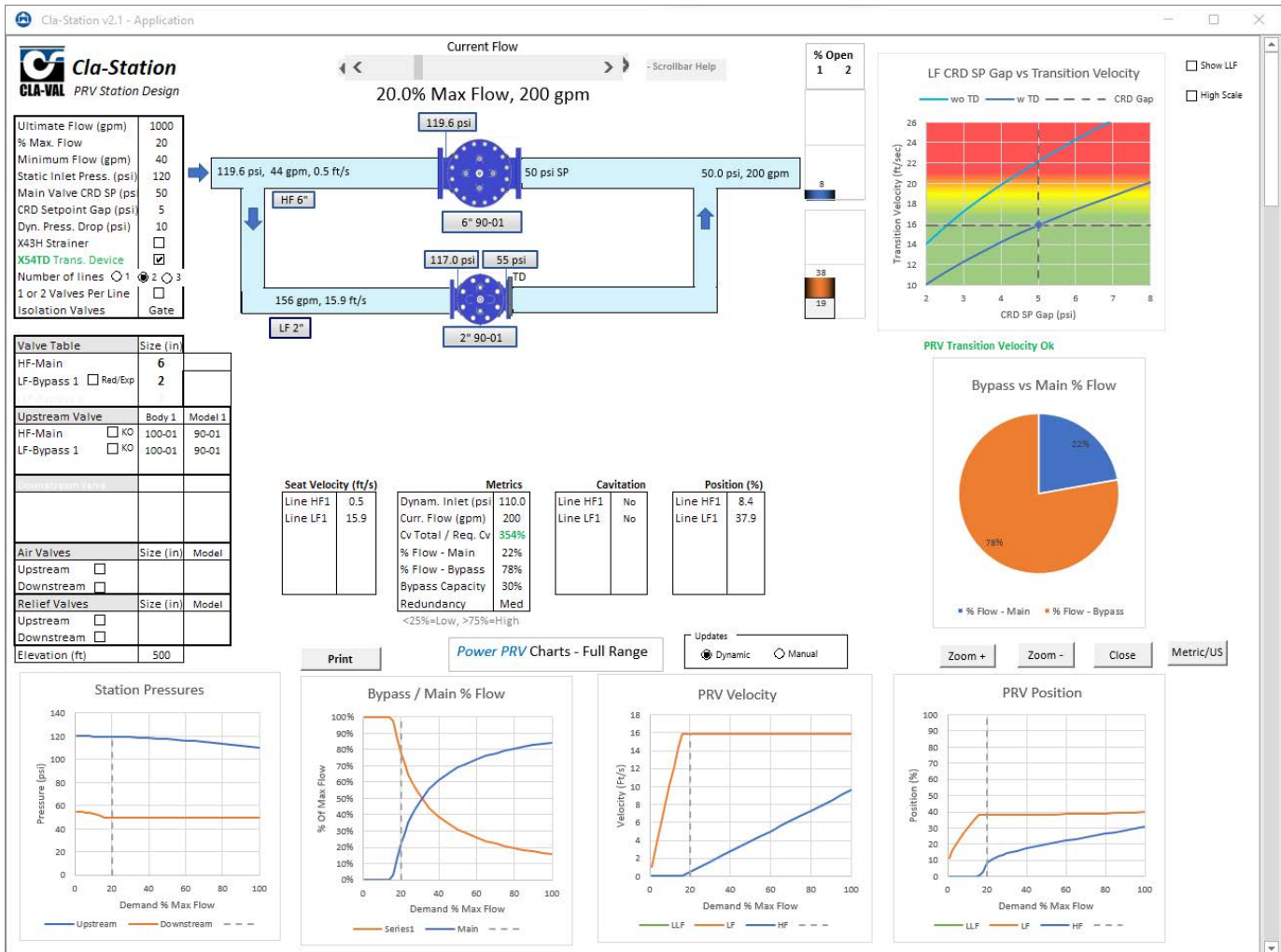
Distance from source: **10** meter

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

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.

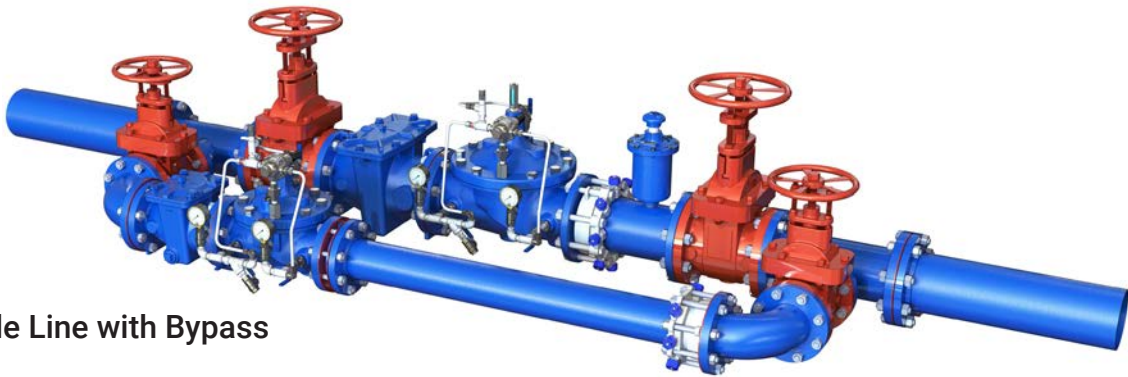


Cla-Station

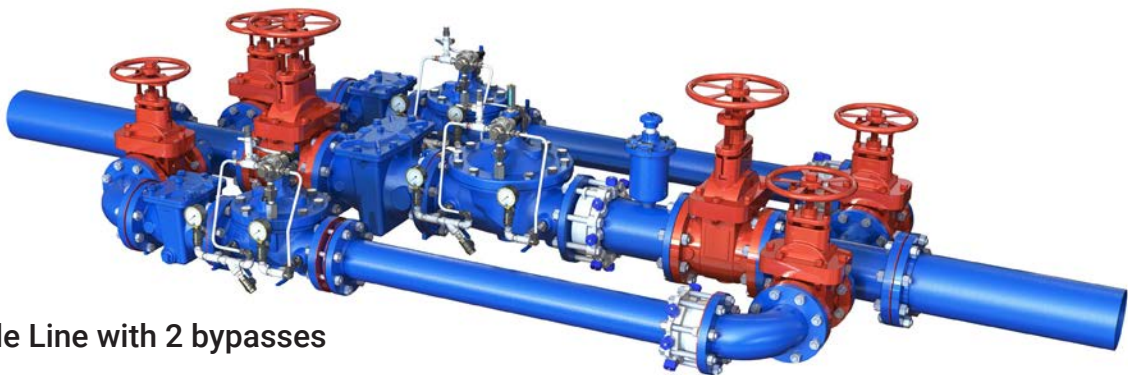
Single Line



Single Line with Bypass



Single Line with 2 bypasses





Cla-Power

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: Add To Table Clear Table Print
 Remove Last Entry

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: 33 gpm
 Flow @ 10% Accuracy: 67 gpm
 R1 Orifice Bore Diameter: 1.492 in

Total Flow vs. Blend Accuracy
 Accuracy (%) vs. Total Flow (gpm) chart showing a curve that starts at 100% accuracy for 50 gpm and levels off around 30% accuracy for 300 gpm.

20-01 (Hydro)

Size (in)	% Cv	Vel. (fps)
1"		
1 1/4"		
2"	70%	10.2
2 1/2"	44%	6.6
3"	33%	4.6
4"	19%	2.6
6"	9%	1.1
8"	5%	0.6

Typical Applications
 Diagram showing a blending system with parameters: P1=80 psi, QTOT=300 gpm, P2=73 psi, Q20-01=100 gpm, P3=50 psi, QTOT=300 gpm, P2=73 psi, QSOFT=200 gpm, R1=1.492 in. Components include RAW WATER INFLUENT, SOFTENER TANK, TREATMENT PROCESS, BLENDING POINT, and X520 Orifice Plate Holder.



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

Cla-Reg is a design tool for sizing both the CRD-L direct acting and 90 Series pilot operated pressure reducing valves for buildings. Well established rules 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 design range.

Cla-Reg 1.3
CRD-L/90 Design

Maximum Flow 45 gpm
Max RPF* Falloff 15 psi
Inlet Pressure 220 psi
Outlet Pressure 50 psi
Minimum Flow 1 gpm

Size	RPF* (psi)	Velocity (ft/sec)
1/2"		
3/4"		
1"	21.3	
1 1/4"	16.4	11.8
1 1/2"	14.0	8.2
2"	12.0	4.6
2 1/2"	8.7	2.9

RPF* - Reduced Pressure Falloff

Settings
Parallel LF Ratio 1/3
Max. Velocity 7 ft/sec
Parallel Flow Sw. 20 gpm
Max. Flow Ratio 10

Add 5033

Cla-Reg 1

Cla-Reg 1 illustrates an example of high pressure drop and very low flow, particularly during low demand. Larger CRD-L pressure regulators are placed in parallel with smaller models to allow optimum performance over typical flow ranges. Because of the high pressure drop they are also placed in series.

Cla-Reg 1.3
CRD-L/90 Design

Maximum Flow 220 gpm
Max RPF* Falloff 15 psi
Inlet Pressure 220 psi
Outlet Pressure 50 psi
Minimum Flow 1 gpm

Size	RPF* (psi)	Velocity (ft/sec)
1/2"		
3/4"		
1"		
1 1/4"		
1 1/2"		
2"		
2 1/2"		

RPF* - Reduced Pressure Falloff

Settings
Parallel LF Ratio 1/3
Max. Velocity 7 ft/sec
Parallel Flow Sw. 20 gpm
Max. Flow Ratio 10

Add 5033

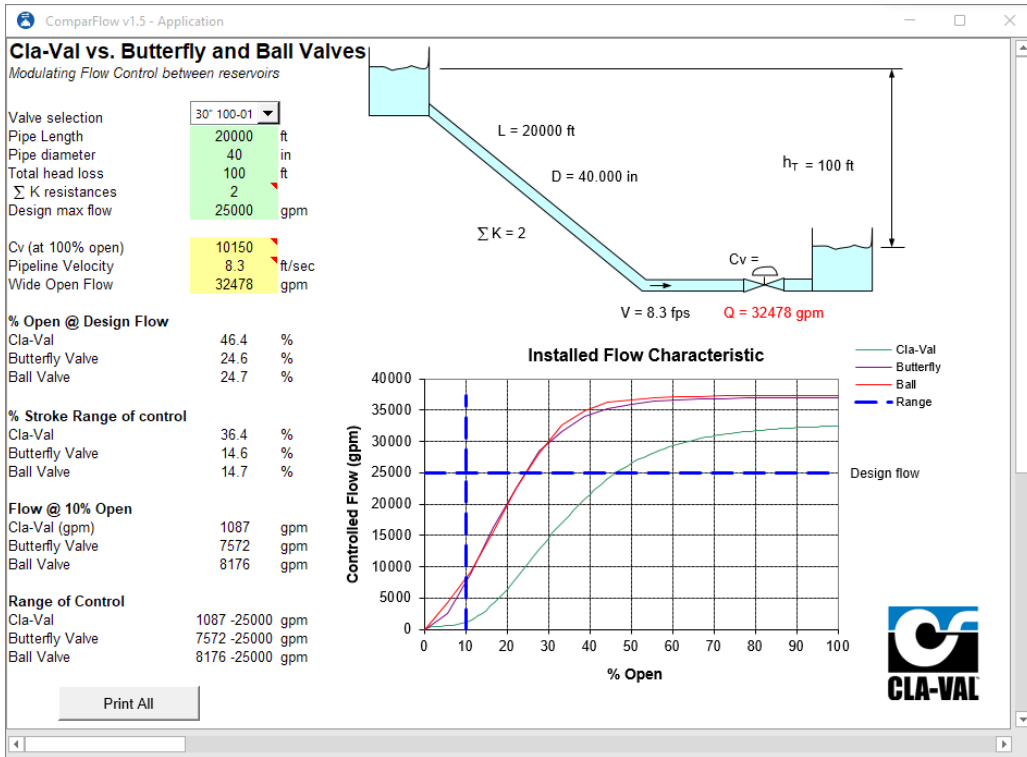
Cla-Reg 2

Cla-Reg 2 illustrates an even wider range of flows where the high flows are best handled with the 90 Series pilot operated pressure reducing valves. In addition, for protection in the event of malfunction, a safety model 50-33 Series valve is placed downstream which automatically closes on an over pressure condition to protect against damage to downstream plumbing.

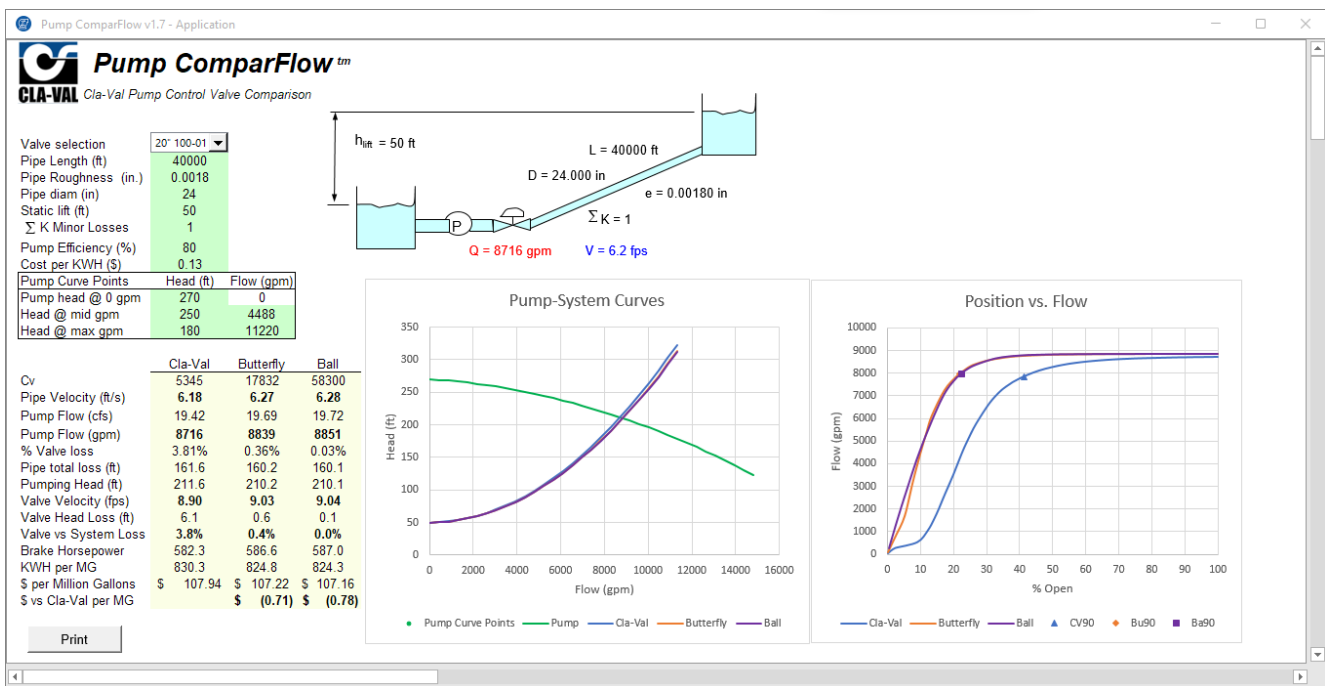




ComparFlow

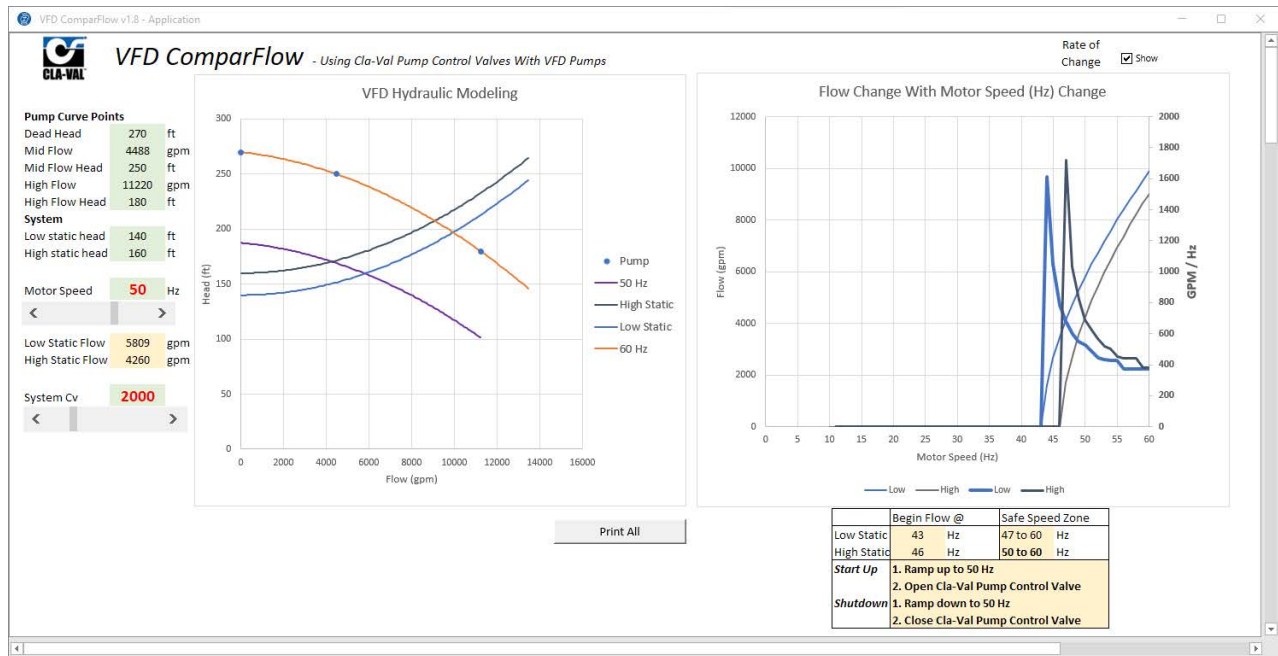


Pump ComparFlow





VFD ComparFlow



ComparFlow

There are a trio of programs for gravity flow, pumping flow and pumping flow with VFDs focusing on valve installed “controllability” with 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.



Cla-Fire



Cla-Fire
Fire Valve Sizing
Factory Set Pressure Regulating Fire Valves

Static Inlet Pressure: 260 (psi)
Residual Inlet Pressure: 230 (psi)
Flow: 220 (gpm)
Desired Residual Outlet: 120 (psi)

Value Type	Max Inlet (psi)	UL Rating	Max Flow (gpm)	Static Outlet (psi)	Residual Outlet (psi)	Difference to Desired (psi)
0	170	500	215	181	111	11
1	220	500	202	162	102	18
2	270	500	185	147	97	23
3	265	500	167	132	82	38
4	300	500	148	117	67	53
5	350	500	129	102	52	68
6	360	500	118	88	38	82
7	400	500	103	74	24	96

Instructions: (Excel 2010 or higher is recommended)
1. Enter data in green input data section.
2. Review results in the table.
- red values - outlet press. > UL Max. 175 psi or Max inlet press. exceeded
- yellow values - outlet pressures within 5 psi of UL limit of 175 psi.
- green values represent available models within 20 psi of Desired Outlet
- green bold line appears if minimum Difference to Desired is available
- confirm performance in Residual and Static Pressure Charts
3. Complete Valve Form and select Valve Type based on the table and graph results. (Enable Macros to Write to Form)

Notes:
Calculated outlet pressures have a tolerance of +/- 10%.
Static and residual outlet must be below 175 psi for UL approval.
Ensure any valve selected meets requirements of NFPA 13 & 14, and/or UL.

2.5" 90-FS-PRV Angle Body (200-300 gpm)

2.5" 90-FS-PRV Angle Body

Valve Form - Enter data in blue sections. When ready click Add To Form button.

Current Add To Form	Project	ABC Building	Floor	1	Sprinkler	260	230	220	120	FF	Select	Name	
Print Form	City	Location	Tag	Standpipe	Static Inlet (psi)	Residual Inlet (psi)	Flow (gpm)	Desired Residual Outlet (psi)	Static Outlet (psi)	Residual Outlet (psi)	Connect Inlet / Outlet	Valve Type	Monitor Switch
Erase Last													

Cla-Fire

Allows quick sizing analysis of the direct acting Factory Set series of Pressure Regulating Valves.



Cla-Fire ADJ
Fire Valve Sizing
Adjustable Pressure Regulating Fire Valves

Static Inlet Pressure: 300 (psi)
Residual Inlet Pressure: 250 (psi)
Flow: 250 (gpm)
Desired Residual Outlet: 120 (psi)

PRV Setting	Max Inlet (psi)	UL Rating	Max Flow (gpm)	Static Outlet (psi)	Residual Outlet (psi)	Difference to Desired (psi)
1	200	500	129	95	65	55
2	305	500	148	107	77	43
3	370	500	162	120	90	30
4	390	500	170	129	99	21
5	390	500	170	141	111	9
6	400	500	170	149	119	1

Instructions: (Excel 2010 or higher is recommended)
1. Enter data in green input data section.
2. Review results in the table.
- red values - outlet press. > UL Max. 175 psi or Max inlet press. exceeded
- yellow values - outlet pressures within 5 psi of UL limit of 175 psi.
- green values represent available models within 20 psi of Desired Outlet
- confirm performance in Residual and Static Pressure Charts
3. Complete Valve Form and select Valve Type based on the table and graph results. (Enable Macros to Write to Form)

Notes:
Calculated outlet pressures have a tolerance of +/- 10%.
Static and residual outlet must be below 175 psi for UL approval.
Ensure any valve selected meets requirements of NFPA 13 & 14, and/or UL.

Reference Charts

90-ADI-25 - 2.5" ANGLE (250 gpm)

90-ADI-25 - 2.5" ANGLE (300 gpm)

90-ADI-25 - 2.5" ANGLE (STATIC)

Valve Form - Enter data in blue sections. When ready click Add To Form button.

Current Add To Form	Project	ABC Building	Floor	1	Sprinkler	300	250	250	120	FF	Select	Name	
Print Form	City	Location	Tag	Standpipe	Static Inlet (psi)	Residual Inlet (psi)	Flow (gpm)	Desired Residual Outlet (psi)	Static Outlet (psi)	Residual Outlet (psi)	Connect Inlet / Outlet	Valve Type	Monitor Switch
Erase Last													

Cla-Fire ADJ

This version is for the new Adjustable direct acting series PRVs. Both offer color coded tables to quickly evaluate the best options. A fill out table detailing each floor valve type or adjustment setting ensures correct design to meet NFPA 13 & 14 and/or UL requirements.



Cla-Check

Cla-Check
Check Valve Analysis

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.

Calculate

Estimated Time of Closure: 0.99 seconds

Valve Position & Pressure Drop v. Velocity

Valve Position v. Time - Closing Cycle

Print

**NOTE: If pressing the "Calculate" button on 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 (Hyrol)

Size (in)	Vel. (ft/s)	% 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	35.7	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

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

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): 300000 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

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" 100-20
Smaller 6" 100-01	8" 100-20

Available Relief Valve Sizes (DUAL Equal Sizes)

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

Surge Relief Flow Required as % of Pumping Flow

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.

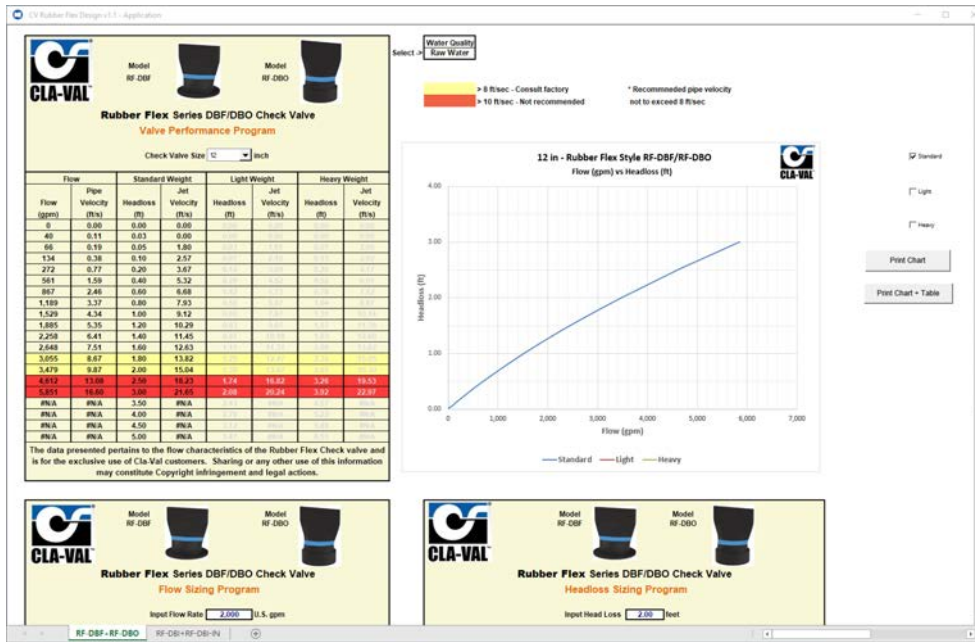
Cla-Relief

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.

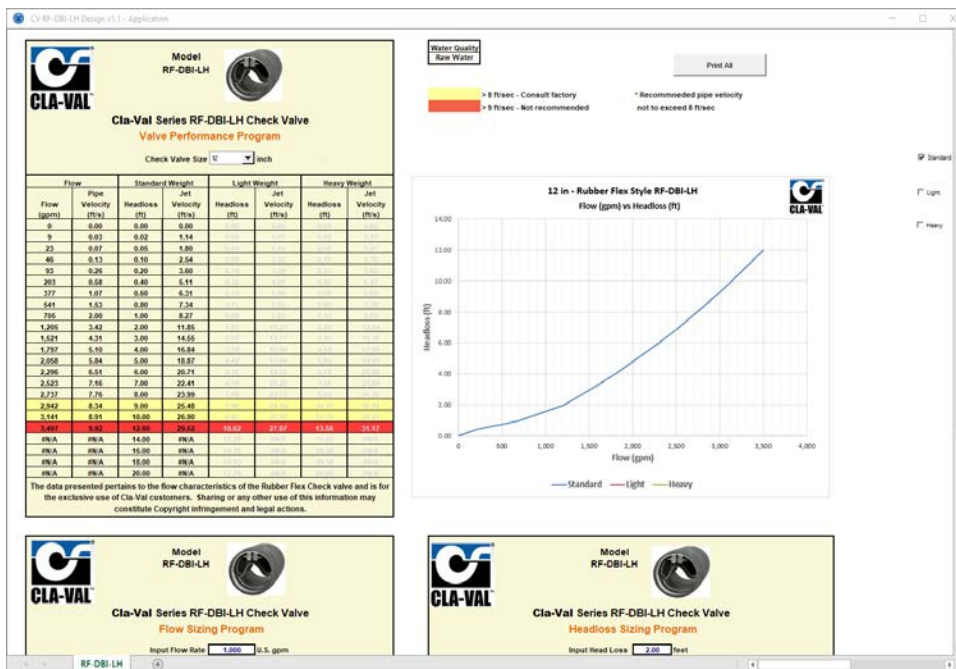




CV Rubber Flex



CV RF-DBI-LH




CV Rubber Flex Design & CV RF-DBI-LH Design

These programs provide sizing and performance information for the Rubber-Flex Duckbill Check Valves. Charts are provided for sizing based on headloss or for a given flow. With any given size charts are displayed which detail headloss at any flow rate. Velocity limits are given based on raw water or clean water. Each model has separate charts based on laboratory tests.



Cla-AV

CLA-VAL  **Cla-AV - Dynamic Air Valve Design**
 - AV Design for Models 33A, 33AWS, 34-35-36

Cla-AV Design Template Analyze

Cla-AV Inputs

Project: Test Pipeline
 Analysis by: John Smith
 Design Flow: 7000 gpm
 AV Max. Dist.: 2500 ft
 Inlet Pressure: 210 psi
 Pump / Gravity: Pumping
 Units: US gpm, ft, psi

Pipe Inputs

Pipe Sizes: 2
 Material: Steel
 H-W C Factor: 130
 OD Pipe 1: 24 in
 Wall Thick. 1: 0.125 in
 Safety Factor: 4
 Begin Pipe 2: 40500 ft
 OD Pipe 2: 24 in
 Wall Thick. 2: 0.125 in

Drain Valve / Rupture Locations

NumDrains: 5
 Location 1: 300
 Location 2: 7050
 Location 3: 30600
 Location 4: 67916
 Location 5: 72475

Notes

- Fill out all green sections completely.
- Include all Drain Valve locations. Rupture points should be included.
- Up to 200 points and 2 pipe sizes allowed
- Hazen-Williams pipe flow. Enter H-W C factor - Steel/Ductile Iron 100-130, Plastic - 130-150
- Profile points only at slope changes**
- Requires Excel 2013 or later

Clear Inputs

Pipe Inputs Profile

Dist. (ft)	Elev. (ft)
0	535
300	510
1700	540
2050	530
2400	545
2750	550
3150	550
4300	590
4600	580
4850	590
5250	550
5750	555
6800	540

Pipeline Profile

Cla-AV Inputs

New Cla-AV dynamic Air Valve design software provides visual design of air valve placement and sizing along pipelines following AWWA and international guidelines. The page of inputs allows quick entry of pipeline profile, piping characteristics, and Drain and/or Rupture locations. A pipeline profile graph shows convenient confirmation of correct entry of data.

Cla-AV Analysis - Fill + Drain

Fill Velocity: 1 ft/s
 Drain Pct: 50
 Pct Design Flow: 50 Reverse Air Flow
 Model: 33A
 Fill Press.: 2 psi

Cla-AV Analysis - Fill + Drain

AV Location Rules

- HP: High Point
- HPH: High High Point (Event restriction)
- DU: Decreasing Uphill slope
- ID: Increasing Downhill slope
- LA: Long Ascend
- LH: Long Horizontal
- LD: Long Descend
- DVx: Drain Valve or Rupture Point

Cla-AV Analysis - Fill + Drain

AV Press. (psi)	Dist. (ft)	Elev. (ft)	AV Rule	Air Flow (cfs)	AV Model	AV Size	AV Summary	Comments	
210.0	0	535	HP	9.3	33A	3"	1"		
220.4	300	510	DV1				2"	16	
205.4	1700	540	HP	9.3	33A	3"	3"	10 2	
209.2	2050	530					4"	19 8	
202.2	2400	545	DU	9.6	33A	3"	6"	1	
199.5	2750	550	HP	10.0	33A	3"	8"		
158.9	3150	550					10"		
179.9	4300	590	HP	25.6	33A	4"	12"		
183.8	4600	580							
179.1	4850	590	HP	25.7	33A	4"			
155.8	5250	550							
152.9	5750	555	HP	9.4	33A	3"			
197.9	6800	540	ID	7.2	33A	3"			
204.0	7050	525	DV2						
192.8	7900	550	HP	9.4	33A	3"			
201.1	7600	530							
Total							46	11	
							Ratio of 12"	33A	
							0.39	8" x 8"	
							1.03	12" x 3"	

Chart Navigation - Labels

Marker: Label Down
 Pts: Model

Chart Scaling

Lower	Range	Shift
0	80000	10000
450	300	50

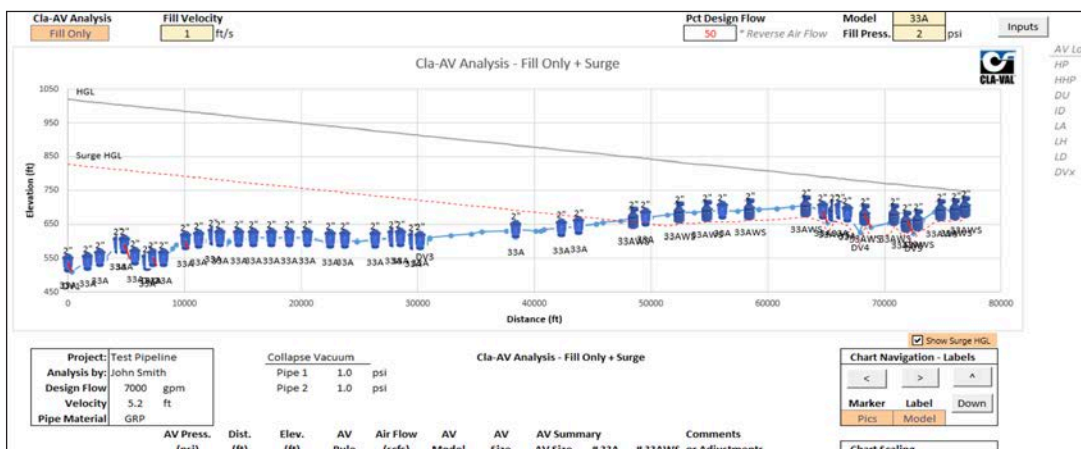
Cla-AV Design

The Analysis section first displays the entire pipeline with air valves located and sized for the default Filling scenario only. Above the graphic chart are settings for the type of air valve analysis, specific adjustment for each scenario, such as filling velocity, and air valve model. Both the 33A and traditional 34, 35, and 36 Series are supported. A percentage of Design Flow adjustment allows visual indication of potential "blowback" conditions and are indicated by red pipe sections and where damaging surges can occur.



Cla-AV Design 2

Multiple scenarios can be quickly reviewed for not only Burst (or gravity) Flow but also Drain Valve operation and Rupture events at designated susceptible locations. Air valve locations and sizing are automatically performed and graphically shown with each specific scenario. Combination scenarios are available for Filling and Burst (gravity flow) and Filling and Draining (pressurized flow). Zooming in on portions and navigation along the pipeline are possible with navigation controls. A table is available below detailing locations, air flow, and the rules for using the air valves, such as at High Points and at Increasing Downslopes. A summary table shows totals of each model and size used.



Cla-AV Design 3

Often overlooked in air valve design is potential surges caused during surge events such as power failure at a pump station. Cla-AV makes available both the steady state HGL and the resulting HGL during a sudden stoppage of flow. The Surge HGL, shown with a dotted red line, illustrates where vacuum conditions occur. Surges can be caused by air valve slam effects when pressure recovers and all air is vented. Cla-AV predicts where this may occur and susceptible locations have 33AWS air valves with adjustable Throttling Devices to slow the exhaust to avoid surges caused by air valve slam.

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