FLUID CONTROL RESEARCH INSTITUTE

एफ.सी.आर.आई.

AUTOVALV 1.0

A SOFTWARE FOR CONTROL VALVE SELECTION AND SIZING

AUTOVALV
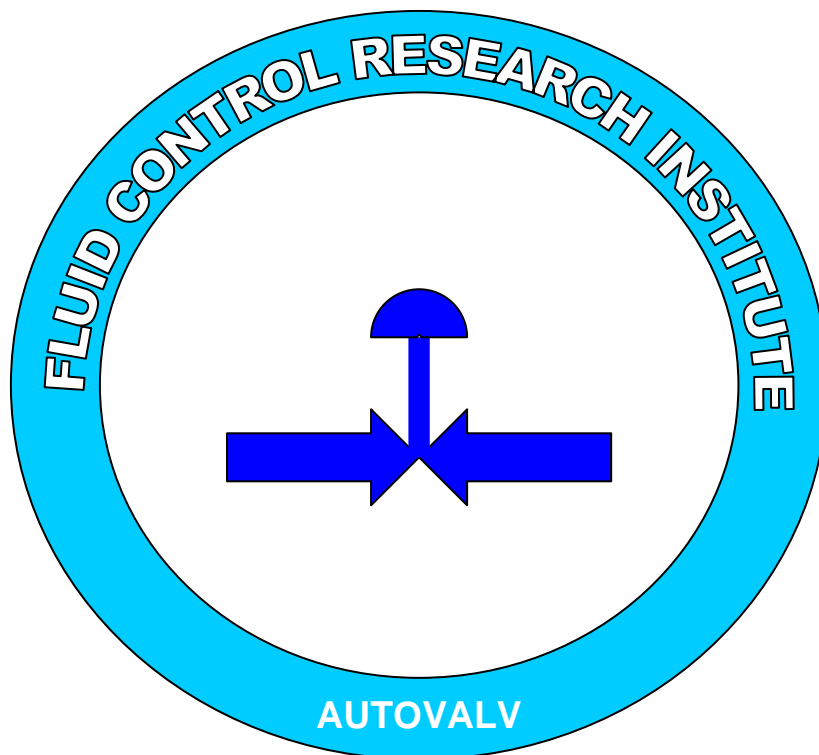
FLUID CONTROL RESEARCH INSTITUTE
KANJIKODE WEST
PALAKKAD – 678 623
KERALA - INDIA

FCRI
SOFTWARE
ACTIVITIES

SCOPE

Valves are the controlling elements in fluid flow and pressure systems. The wide range of valve types available, is gratifying to the user, for the chances is very high that a valve exists which matches his application, but because of the innumerable alternatives the user must have the knowledge and skill to analyse each application and determine the factor on which the valve can be selected. Even if the user is able to determine the valve type he is to use, he is required to select the appropriate valve size that matches his application. Both selection of the valve and determination of its size involves a lot of conditions and a requires a lot of consulting. It is precisely for this reason that AUTOVALV has been developed. AUTOVALV acts as a consultant for the user to decide on the valve he is to use and the size he is to choose for his application.

STANDARD FEATURES

AUTOVALV is a very user-friendly software in which the user is able to select the appropriate valve which meets the technical performance specifications, by just some keystrokes. Very little help is required to run the program, however a complete instruction manual is included. Inputs are through easy pull-down or popup Menus. Error traps are provided to ensure validity of data.

AUTOVALV has two options, one for selecting and sizing a valve, another for sizing a selected valve. Sizing is simple and quick as it uses the equations provided in the ISA standard 75.01. Selection, chooses a valve from a database of 21 valves given below based on the input conditions.

Screen Display showing data entry

1. Single seated wing guided globe
2. Single seated V skirt globe
3. Single seated contoured globe
4. Single seated V plug globe
5. Single seated cage globe
6. Double seated wing guided globe
7. Double seated contoured globe
8. Double seated V skirt globe
9. Double seated V plug globe
10. Standard bore ball
11. Characterized ball
12. Butterfly 60 deg. open
13. Butterfly 90 deg. open
14. Full port contour Angle
15. Angle cage
16. Angle venturi
17. Rotary eccentric plug
18. Restricted contour Angle
19. 2:1 Tapered Angle
20. Butterfly 90 deg. Offset
21. Butterfly fluted vane

All the above valves except V skirt globes, Restricted contour angle and 2:1 Tapered angle are considered for choking and cavitation in sizing also. Selection supports 6 body materials, which are listed below

1. A216A Cast Iron
2. A395 Ductile Iron
3. B62 Bronze
4. A216 WCB Carbon steel
5. A351 CF8M Stainless steel
6. A351 CF8 Stainless steel

AUTOVALV supports around 27 fluids for which a valve can be selected or sized just by specifying the inlet temperature of the fluid. Autovalv respectively would find the viscosity and specific gravity or specific gravity and compressibility factor of the liquid or the gas for these 27 fluids. For other liquids the user is to specify the specific gravity and viscosity. Besides liquids and gases AUTOVALV also supports dry saturated steam.
The fluids supported are

1. Acetyline
2. Benzene
3. Carbon tetra chloride
4. Ethanol
5. Water
6. Air
7. Ammonia
8. Argon
9. Bromine
10. Butane
11. Carbon di-oxide
12. Carbon monoxide
13. Chlorine
14. Ethane
15. Ethylene

FCRI
SOFTWARE
ACTIVITIES

16. Helium	17. Hydrogen	18. Hydrogen Chloride
19. Hydrogen sulphide	20. Iso-butane	21. Methane
22. Nitrogen	23. Nitrous oxide	24. Oxygen
25. Propane	26.Propylene	27. Sulphur di-oxide

Autovalv also provides a range of unit choices that are readily available by pressing a hot key during data entry. The various units are

Flow rate (weight)	-	lb/hr, kg/hr
Flow rate (volume)	-	gal/min, sm3/hr, l/hr, ft3/hr,nm3/hr
Pressure	-	lb/in2, bar, atm, mmHg, Pascal, Kg/cm2
Temperature	-	deg R, deg C, deg F, deg K
Length	-	inch, mm, cm, meter

Online help is also provided wherever necessary by usage of another hot key. Provision is also made to store the results in a file on the disk or to print it.
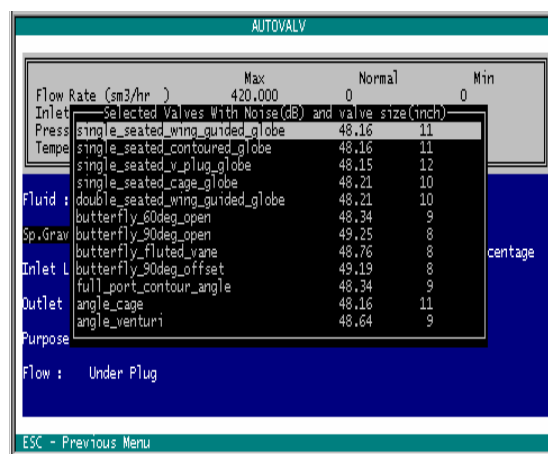
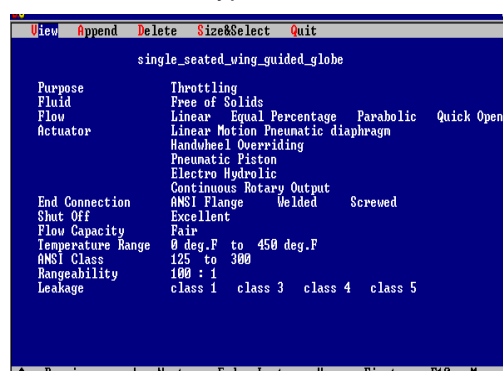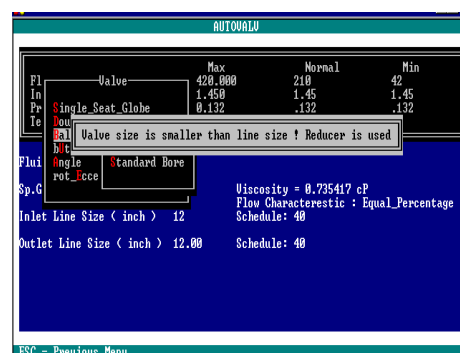Screen Display showing selected valves

OPTIONS

Selection is an option mainly used to select and size a valve for the specified input conditions from the database of 21 valves. It can also be used to view the properties of valves in the database or modify the database by appending or deleting valves. The parameters considered for selection of the valve are temperature, ANSI class, leakage class, fluid characteristic and purpose. Based on these parameters a list of valves from the database is short listed as selected valves. Depending on the input conditions and service, suitable body material is selected. Other parameters like gasket, packing material and bonnet type is chosen based on temperature. The inner diameter and the thickness of the line is obtained from in-built data files once the line size and a schedule is chosen. For these valves sizing is performed checking for cavitation and choking. Those valves found cavitating or choking is discarded from the selection list. For the selected list noise calculation is performed and the noise level along with the respective valve is displayed for the user to make his choice based on cost consideration and the noise level desired.

Screen display showing valve properties

Sizing calculates valve coefficient and valve size besides checking for cavitation and choking. It also performs noise calculations for the valve specified. It can be used to calculate flow rate or differential pressure of the valve depending on the parameters known. Sizing is based on the equations given in the ISA standard 75.01.Representative values are used for various parameters like Fl, Xt etc. For exact results use those given in the manufacturers' catalogues.

Screen display showing valve sizing

FCRI
SOFTWARE
ACTIVITIES

System Requirements
A PC with DOS version 3.0 or above and 640 KB RAM.
The software is used by Major industries like IPCL, Hindusthan Newsprint, etc.

```
AUTOVALV 1.0          FLUID CONTROL RESEARCH INSTITUTE

                         RESULTS
                         ⱵⱵⱵⱵⱵⱵⱵ
```

Operating Conditions :

		Max	Normal	Min	
Flow		420	0	0	m3/hr
Inlet Pressureʊ	At ʊ	1.45	0	0	bar
Pressure Drop ʊ	Stated ʊ	0.132	0	0	bar
Temperature ʊ	Flow Rateʊ	34	34	34	deg.C

Leakage Class : class 1   Service : General

Fluid Details :
   Fluid : water
   Vapour Pressure : 0.05423 bar
   Specific Gravity : 0.9775
   Viscosity   : 0.7354 cP

Pipe Details:
   Inlet Line Size : 12   Inch   Schedule: 40
   Thickness   : 0.406   Inch   Inner Diameter : 11.94 Inch
   Inlet Line Velocity : 5.242   ft/s
   Required Reducer Size : 12Inch   x 10Inch
   Required Diffuser Size : 10Inch   x 12Inch
   Fp : 0.9849
   Outlet Line Size: 12   Inch   Schedule: 40
   Thickness   : 0.406   Inch   Inner Diameter : 11.94 Inch
   Oulet Line Velocity : 5.242   ft/s

Valve Details:
  Body:
   Valve Style   : single_seated_cage_globe   Cd : 14
   Body Material : a351_CF8M_Stainless_steel
   Rated Cv   : 1400
   Body size   : 10   Inch   Port Size: 10   Inch
   Rating   : ANSI 150
   Connections   : Flanged
  Trim:
   Cv Required : 1342
   Flow Characterestic : Equal_Percentage
   Flow Regime : TURBULENT   FR: 1
   Fl : 0.9   Xt : 0.75   Kc : 0.65
   Fs : 1.06   Fd : 1

 Noise:
      Predicted SPL (dB): 48.17
   Δp for choked flow to occur : 1.144   bar
   ΔP for incipient cavitation to occur : 0.9179   bar
   Rangeability - 30 : 1

   % opening 10   20   30   40   50
   Cv   65.6 92.1 129.5 181.9 255.6
   % opening 60   70   80   90   100
   Cv   359.2 504.7 709.1 996.4 1400.0

FCRI
SOFTWARE
ACTIVITIES