



## Control Valve Sizing in Aspen Hysys



Example 1: Size the control valve with the following conditions. The control valve acts as PV and is installed at the outlet of a methanol plant inlet K.O. drum.

Parameter	Value	Unit
Flow	133000	Kg/hr
Fluid	Methane	
Fluid Package	PR	
Pressure 1	52.9	bara
Pressure 2	51	bara
Temperature	40	C

Size the control valve in both Aspen Hysys and Fisher and compare the input provision and results.



### Sizing in Aspen Hysys

Steps to be taken:

1. Add Methane to component list
2. Select Peng-Robinson as fluid package
3. Enter simulation environment and provide the process data.
4. Select a control valve and connect stream 1 to its inlet while connect stream 2 to its outlet.
5. Specify the pressure drop in control valve based on given table.
6. Go to rating tab, select universal gas sizing, specify the opening to be 100%. Also specify the characteristic to be linear.

Note:

Valve characteristics

A unique and simple procedure for valve characteristic determination for almost all Chemical Plants.

1. Use Equal Percentage if the valve functions as FV or TV
2. Use Linear if the valve functions as PV or LV
3. Use Linear if there is Split Range Control

Note: Due to process demands, above rules might not apply to some situations.





Valve: VLV-100

Design Rating Worksheet Dynamics

**Rating**

Sizing  
Nozzles  
Options  
Flow Limits

Valve Operating Characteristics

☒ Linear  
☐ Quick Opening  
☐ Equal Percentage  
☐ User Table

Valve Vapor Flow Models

Universal Gas Sizing

Size Valve

Sizing Conditions ☒ Current ☐ User Input

Inlet Pressure [kPa]	5290
Molecular Weight	16.04
Valve Opening [%]	100.00
Delta P [kPa]	190.0
Flow Rate [kg/h]	1.330e+005

Sizing Methods ☒ Cv ☐ Cg

☐ ANSI/ISA method  
☒ Manufacturer specific methods  
☐ Simple resistance equation

C1	33.5
Km	0.9000
Cv [USGPM(60F,1psi)]	610.5
Cg	20431

Delete OK Ignored

Now select Fisher as vapor flow model and size valve again.

Valve: VLV-100

Design Rating Worksheet Dynamics

**Rating**

Sizing  
Nozzles  
Options  
Flow Limits

Valve Operating Characteristics

☒ Linear  
☐ Quick Opening  
☐ Equal Percentage  
☐ User Table

Valve Vapor Flow Models

FISHER

Size Valve

Sizing Conditions ☒ Current ☐ User Input

Inlet Pressure [kPa]	5290
Molecular Weight	16.04
Valve Opening [%]	100.00
Delta P [kPa]	190.0
Flow Rate [kg/h]	1.330e+005

Sizing Methods ☒ Cv ☐ Cg

☐ ANSI/ISA method  
☒ Manufacturer specific methods  
☐ Simple resistance equation

C1	33.5
Km	0.9000
Cv [USGPM(60F,1psi)]	626.1
Cg	20955

Delete OK Ignored



## Sizing in Fisher FSM

### 1.Data entry

Fisher™ Valve Specification Manager

File Edit Profile Contacts View Help

ISA Sheet 1-Installation Data: 2-Valve Sizing 3-Valve Selection 4-Valve Construction 5-Actuator Selection 6-Positioner 7-Additional Accessories

**Installation Data:**

Style:  [D/E](#)

Rating:  [D/E](#)

Nominal Inlet Pipe Size:   [D/E](#) Schedule:  Thickness:

Nominal Outlet Pipe Size:  [D/E](#) Schedule:  Thickness:

End Connection:  [D](#)

Allowable Noise:  dB(A)

Body to Bonnet bolt & nuts material:  Packing Flange Studs & Nuts:

Design Pressure:

Design Temperature:

ANSI Shutoff:  [Help](#)

Service Description:

Previous Next



## 2.Process data entry

Fisher™ Valve Specification Manager

File Edit Profile Contacts View Help

ISA Sheet | 1-Installation Data | 2-Valve Sizing | 3-Valve Selection | 4-Valve Construction | 5-Actuator Selection | 6-Positioner | 7-Additional Accessories

MyProjects  
PV-1006  
Tag1  
PV-1006

Name	Units	Minimum	Normal	Maximum	Others
<b>Warnings:</b>					
Warnings:		YES	NO	YES	YES
<b>SIZING INPUTS</b>					
Gas					
Mass Flow Rate Gas	kg/h		133000.0000		
Inlet Pressure	bar(a)		52.90000		
Outlet Pressure	bar(a)		51.00000		
Inlet Temperature	deg C		40.0000		
Molecular Weight / Specific Gravity	M		16.700		
Dynamic viscosity	cP		0.013		
Ratio of specific heats			1.280		
Inlet Compressibility Factor		1.000	0.930	1.000	1.000
Pressure drop ratio factor (xt)			0.720		0.650
Recovery Factor (F)			0.900		0.900
Valve style modifier (Fd)			1.000		0.350
Upstream pipe size	in		12		12
Upstream pipe schedule		STD	STD	STD	STD
Downstream pipe size	in		12		12
Downstream pipe schedule		STD	STD	STD	STD
Valve Diameter	in	12.000	12.000		12.000
<b>IEC NOISE INPUTS</b>					
Valve/Trim for aerodynamic noise		Globe/Angle	Globe/Angle		
Aerodynamic distance Rn	in	39.37	39.37	39.37	39.37
Valve Outlet Area	in <sup>2</sup>		113.000		
Outlet temperature	deg C		40.0000		
Outlet Compressibility Factor		1.000	0.930	1.000	1.000

Add Condition Delete Condition Reset Condition Summary Config

Sizing Assistant  
☐ See Default Value Messages Maximum Maximum < >

A value for variable 'Inlet Pressure' must be provided.  
Calculate for variable 'Flow Coefficient (Cv)' failed.

Previous Next

Sizing For:  
☐ Liquid  
☒ Gas  
☐ Vapor  
☐ Steam  
☐ Fisher Real Gas  
☐ Water  
☐ Pulp  
☐ 2-phase liquid/gas  
☐ 2-phase liquid/vapor  
☐ Simple Cv

Diffuser Model  
None

Design Condition  
Minimum

Solve For  
☒ Cv ☐ dP ☐ Q (Flow)

Piping  
☒ Size/Schedule  
☐ Size/Thickness

Insulation Credit  
☐ Acoustic  
☐ Thermal  
☒ None

Estimate  
☐ Compressibility

Default Wizard  
Calculate  
Cancel Conditions



### 3.FSM Output

Fisher™ Valve Specification Manager

File Edit Profile Contacts View Help

ISA Sheet | 1-Installation Data: | 2-Valve Sizing | 3-Valve Selection | 4-Valve Construction | 5-Actuator Selection | 6-Positioner | 7-Additional Accessories

MyProjects  
PV-1006  
Tag1  
PV-1006

**SIZING OUTPUTS**

Flow Coefficient (Cv)			596.202	
Volumetric Flow Rate Gas	Nm3/h		178368.36506	
Pressure differential	bar		1.90000	
Valve d/PI1 pressure ratio			0.036	
Pipe and fitting flow correction factor			1.00	
Combined recovery factor			0.90	
Adjusted pressure drop ratio factor			0.72	
Inlet Density	kg/m3		36.49	
Kinematic viscosity	cSt		0.35624	0.00001
Expansion factor			0.98	
Reynolds Number			270636125.66	
Choked flow pressure drop	bar		34.82331	
Upstream Inside Diameter	in		12.000	
Downstream Inside Diameter	in		12.000	

**IEC NOISE OUTPUTS**

Whisper III Trim Level				
Trim LpA at 1m	dB(A)		71	
Outlet LpA at 1m	dB(A)	--	< 50	--
Valve LpA at 1m	dB(A)		71	
Valve LpA at Rn	dB(A)		71	

**VELOCITY OUTPUTS**

Mach Number Upstream	Mach		0.031	
Mach Number Valve Outlet	Mach		0.032	
Mach Number Downstream	Mach		0.032	
Fluid Velocity Upstream	m/s		13.8749	
Fluid Velocity Valve Outlet	m/s		14.4042	

Sizing For:  
☐ Liquid  
☒ Gas  
☐ Vapor  
☐ Steam  
☐ Fisher Real Gas  
☐ Water  
☐ Pulp  
☐ 2-phase liquid/gas  
☐ 2-phase liquid/vapor  
☐ Simple Cv

Diffuser Model  
None

Design Condition  
Minimum

Solve For  
☒ Cv ☐ dP ☐ Q (Flow)

Piping  
☒ Size/Schedule  
☐ Size/Thickness

Insulation Credit  
☐ Acoustic  
☐ Thermal  
☒ None

Estimate  
☐ Compressibility

Default Wizard  
**Calculate**  
Cancel Conditions

Add Condition Delete Condition Reset Condition Summary Config

Sizing Assistant  
☐ See Default Value Messages Maximum Maximum < > [Kc Help](#)

Previous Next



Result comparison

CV	Value
CV by Universal Gas Sizing	610
CV by Fisher in Aspen Hysys	626.1
CV by Fisher in FSM	596.2





## Example 2

### 1. Operating Condition

Flowrate	8700 kg/hr.
Inlet Pressure	5.3 barg
Outlet Pressure	4.6 barg
Inlet Temperature	48 C
Liquid Specific Gravity	0.99
Dynamic Viscosity	0.563 cP
Vapor Pressure	-0.9 barg
Critical Pressure	220 barg
Recovery Factor	0.9
Valve Style Modifier	1
Cavitation Coefficient	1
Upstream Pipe Size	3 in
Upstream Pipe Schedule	80
Downstream Pipe Size	3 in
Downstream Pipe Schedule	80
Valve Diameter	1.5 in



## 2.Results

Here is the result of Fisher FSM

SIZING OUTPUTS					
Flow Coefficient (Cv)			12.256		
Application Ratio			0.113		
Pressure differential	bar	▼	0.70000		
Valve dP/P1 pressure ratio			0.111		
Choked flow pressure drop	bar	▼	4.99952		
Cavitation Pressure Drop	bar	▼	6.12210		
Liquid critical pressure drop ratio factor			0.95		
Pipe and fitting flow correction factor			0.99		
Combined recovery factor			0.89		
Kinematic viscosity	cSt	▼	1.000	0.569	1.000 1.000
Upstream Inside Diameter	mm	▼	73.66		
Downstream Inside Diameter	mm	▼	73.66		
Volumetric Flow Rate Liquid	m3/h	▼	8.7971		
Reynolds Number			357087.08		
Inlet Density	kg/m3	▼	989.84		
NOISE OUTPUTS					
Sound Pressure at 1m	dB(A)		< 50		
VELOCITY OUTPUTS					
Fluid Velocity Upstream	m/s	▼	0.5732		
Fluid Velocity Downstream	m/s	▼	0.5732		

Calculated CV	12.25
Pipe Size	3 inches
Valve Size	1.5 inches
Noise	<50 dB(A)



Condition Valve Type	$\Delta P$ very high	Solid	V very high	CV high	Crystallization	Large Flow with low $\Delta P$	Tight Shut-off up to 4 inch	Tight Shut-off above 4 inch	Standard
Angle	✓	✓	✓						
Butterfly						✓		✓	
Ball				✓	✓		✓		
Globe									✓

EXAMPLES
<p>Ex. 1 : A condensate with pressure drop of 40 bar across valve in flashing state requires a flow control valve to regulate the flow</p> <p>Valve Type : Angle</p> <p>Trim Type : EQ%</p> <p>Material : A217 WC9</p>
<p>Ex. 2 : Natural Gas with pressure drop of 2 bar across valve requires a pressure control valve to regulate the pressure.</p> <p>Valve Type : Globe</p> <p>Trim Type : Linear</p> <p>Material : A216 WCB</p>
<p>Ex. 3 : A unit shut-down valve shall be installed with adjacent piping size of 3 inch for an application in which we have water + dissolved CO<sub>2</sub>.</p> <p>Valve Type : Ball Valve</p> <p>Trim Type : Quick Opening</p> <p>Material : A351 CF8</p>

```

graph TD
    A216((A216  
WCB/WCC)) --> MS[Material Selection]
    A351((A351  
CF8/CFM)) --> MS
    MS --> A217((A217  
WC1/WCB/WC9))
    A217 --> HTS[High-Temperature Services  
Flashing Services]
  
```

The flowchart illustrates the material selection process. It starts with two input nodes: 'A216 WCB/WCC' (Non-Corrosive Application) and 'A351 CF8/CFM' (Corrosive Application). Both lead to a central 'Material Selection' box. From 'Material Selection', the process flows to 'A217 WC1/WCB/WC9', which then leads to 'High-Temperature Services Flashing Services'.



Appendix B





### About us

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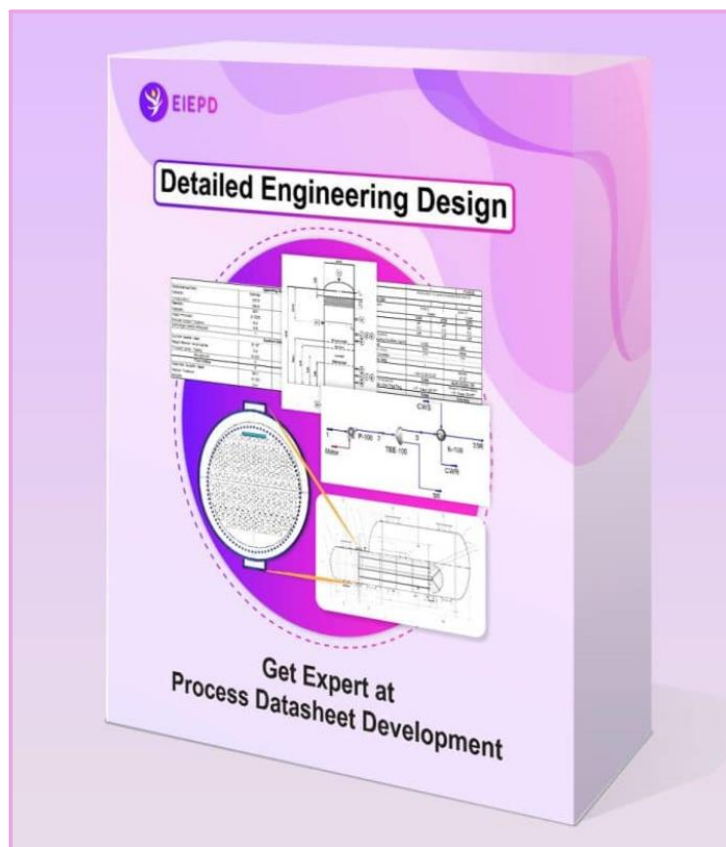
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The Founder and Instructor at EIEPD



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Nigeria	Mr. Epegu Natty	+234 816 881 7181
Pakistan	Mr. Mohammad Safdar	+92 301 6943632

Indonesia	Malaysia	Saudi Arabia	EIEPD Representative
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Tunisia	Canada	UK	+20 15 56611209
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You can also contact us through EIEPD Email:

[training@eiepd.com](mailto:training@eiepd.com)

Here is EIEPD Platform address for further information:

[eiepd.com](http://eiepd.com)