

Process Control Briefings

Weekly News Digest

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Neglected topics in Process Control : Valve Sizing: Overlooked Insights and Challenges

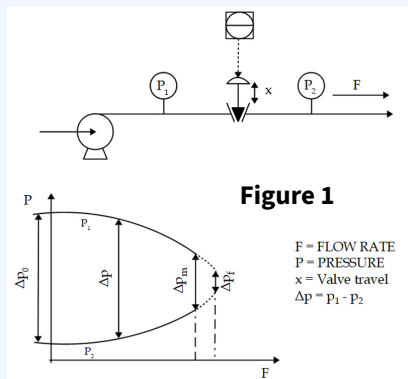
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If it were not..

for the calculation of the pressure differential across the final control element, and the selection of the proper valve characteristic, valve sizing would be straightforward!

Figure 1 shows that the pressure differential across the valve is the difference between the pressure of the process fluid inlet and outlet



Once the specific gravity (SG) and flow (F) of the fluid are known, the valve's Cv can be calculated once the pressure drop (Δp) is determined.

Cv is the flow rate of 60 °F water, measured in gallons per minute (gpm), that passes through the valve at a 1 psi pressure drop.

For liquids the equation is

$$C_v = F \sqrt{\frac{SG}{\Delta p}}$$

You can calculate the Cv using a pocket calculator, your mobile phone calculator app, a slide rule (legacy stuff!), or a fancy software application.

The results are essentially the same, as demonstrated in the following example:

Given...

Inlet pressure: 1000 psig

Outlet pressure: 900 psig

Specific gravity: 0.8

Flow rate: 700 gpm

With the calculator: $C_v = 700 \sqrt{\frac{0.8}{100}} = 62.6$

With the slide rule (**Figure 2**), Cv~ 63

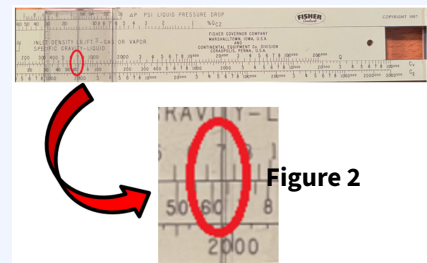


Table 1 presents the results using the software application from the same manufacturer as the slide rule.

Name	Units	Minimum
Warnings:		YES
SIZING INPUTS		
Volumetric Flow Rate Liquid	gpm(US)	700.000
Pressure differential	psi	100.000
Liquid Specific Gravity		0.800
SIZING OUTPUTS		
Simple Cv		62.610

Is this to say that we should be using slide rules instead of computers or pocket calculators? Far from it, the purpose is to emphasize that computer applications are tools; there is no substitution for understanding the process.

Once valve sizing and inherent characteristic are determined, get all the support you may need from the supplier for other critical issues, such as rating, metallurgy, seat leakage, actuator sizing, and type of valve.