Cv FLOW RATE CALCULATIONS FOR VALVE SIZING

The rate of flow of a liquid or gas through a valve depends upon numerous factors such as gravity, the temperature, and pressure drop of the liquid or gas through the valve. The valves design style and flow path affects the rate of flow volume through the valve differently. A "Factor" to account for the relationship of temperature, gravity, and pressure drop through a valve enables the theoretical flow volume through that valve to be calculated. This factor is called 'C_V' (Flow Co-efficient) and it has been developed by the manufacturer through flow tests. Approximate flow capacity can be determined for valves by using the given C_V factor for a valve and applying them to the following formulae's.

Liquids:

$$Q = 34.3\ C_v \sqrt{\frac{\triangle P}{G}}$$

Equation Abbreviations - Liquids:

Q = Flow (Barrels/Day)
Cv = Flow Factor
$\triangle P$ = Pressure Drop Across Valve
G = Specific Gravity (Water=1.0)

Gas:

$$Q = 0.234\ C_v \sqrt{\frac{\triangle P(P_1+P_2)}{G\ T}}$$

Equation Abbreviations - Gas:

Q = Flow (MMSCFD)
Cv = Flow Factor
P_1 = Inlet Pressure (psia)
P_2 = Outlet Pressure (psia)
$\triangle P$ = Pressure drop (P_1-P_2). When P_2 is less than 1/2 P_1, use 1/3 P_1, for P_2 in formula.
G = Specific Gravity (air=1.0)
T = Flowing Temperature Absolute (ºF + 460)

If flow capacity required is known and valve selection is desired, to calculate C_V with the following formulaes and select appropriate valve from the manufacturers C_V factor chart

Liquids:

$$C_V = \frac{Q}{34.3\sqrt{\frac{\triangle P}{G}}}$$

Gas:

$$C_V = \frac{Q}{.0234\sqrt{\frac{\triangle P(P_1+P_2)}{G\ T}}}$$

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