Resistance Coefficient K from Cv or Kv

Calculating Resistance Coefficient K from C_V or K_V

by Engineered Software, Inc.

For control valves, the valve capacity and flow characteristics are typically expressed in terms of a valve flow coefficient (C_V). This article discusses how this flow coefficient can be used to calculate the equivalent resistance coefficient, or K value, used in the Darcy Weisbach equation.

The flow coefficient C_V is defined as the flow rate of 60°F water (in gpm) which can be passed by a valve with a pressure differential of 1 psid.

Similarly, the flow coefficient K_V represents the flow of water in m³/hr which can be passed by a valve with a pressure differential of 1 bar.

K_V is related to C_V by the following equation:

$$K_v = (0.865)C_v$$

The resistance coefficient (K) that is calculated or entered by the user on PIPE-FLO®'s valve/fitting screen is

$$K = f\frac{L}{D}$$

Where,
f = Darcy friction factor
$\frac{L}{D}$ = equivalent length of a resistance to flow, in pipe diameters.

K can be calculated from the valve coefficient C_V using the following equation:

$$K = \frac{890.9d^4}{C_v^2}$$

Where,
d = inside diameter in inches

Or, using the coefficient K_V:

$$K = \frac{890.9d^4}{\left(\frac{K_v}{0.865}\right)^2}$$

If you know the C_V flow coefficient for a valve, you can either calculate a K value using the equation above, or you can use the dP Calculator feature to quickly determine the corresponding K value.

To use the dP Calculator feature, simply specify the C_V value for the flow rate (in gpm) and a pressure drop of 1 psi in the dP Calculator. The program calculates the corresponding K value.