Worksheet No. 1

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rev. 2.8 by M. Fraganza and M. Miccio on 30.03.2021

Objective

Simple worksheet for the calculation of the C_v Flow Coefficient and Conversion of Data Units, starting from design conditions that can be assigned "as desired".

Data input

Select liquid:

- Sea water
- Gasoline
- Glycerine
- Mercury
- Olive oil
- Paraffin oil

specific density

$$G_f := \frac{\rho \cdot \left(\frac{kg}{m^3}\right)}{1000 \cdot \left(\frac{kg}{m^3}\right)}$$

►►► $G_f = 1.025$

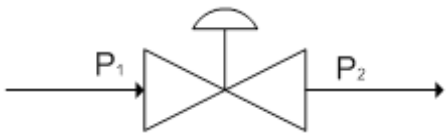
Input upstream pressure P_1

1900

- atm
- Pa
- psi
- torr

Input downstream pressure P_2

1444



Input volumetric flow rate V_{punto}

4.351

- L/s
- gal (US)/min

Recalculate

UNITS CONVERSION of DATA by MathCad

$P_1 = 36.74 \cdot psi$

$P_2 = 27.922 \cdot psi$

Calculation of the flow coefficient

$$C_v := \frac{V\_punto}{\sqrt{\frac{P_1 - P_2}{G_f}}} \qquad C_v = 23.513 \cdot \frac{gal}{min \cdot psi^{0.5}}$$

$$K_v = \frac{C_v}{1.16} \qquad K_v = 20.339 \cdot \frac{m^3}{hr \cdot bar^{0.5}}$$

Flow Coefficient in SI units

UNITS CONVERSION of DATA with the aid of a Conversion Table - Approach No.2

$$\rho := 1025 \frac{kg}{m^3} \cdot \left(\frac{1 lb}{0.4563 kg}\right)\left(\frac{1 m^3}{35.3146 \cdot ft^3}\right) = 63.609 \cdot \frac{lb}{ft^3}$$

$$V\_punto := 4.351 \cdot \frac{L}{s}\left(\frac{60 s}{1 min}\right) \cdot \left(\frac{0.26417 \cdot gal}{1 \cdot L}\right) = 68.964 \cdot \frac{gal}{min}$$

$$P_1 := 1900 \cdot torr \cdot \left(\frac{0.01934 \cdot psi}{1 torr}\right) = 36.746 \cdot psi$$

$$P_2 := 1444 \cdot torr \cdot \left[\frac{1 \cdot Pa}{\left(7.5 \times 10^{-3}\right) \cdot torr}\right] = 1.925 \times 10^5 \cdot Pa$$