HW 2.3

Wednesday, March 1, 2023 6:17 PM

CHAPTER 15: 4, 9, 15

4) 10-in diameter pipe, flow rate 25 gal/min, ammonia sg = 0.83, dynamic viscosity: 2.5×10^{-6} lb/ft·s

Find the deflection of a water manometer, (a) if the orifice diameter is 1.0 in (b) if the orifice diameter is 7.0 in

10 in diameter Pipe
= 0.833 ft
A = 0.545 ft

Orifice diameter 1.0 in

Area: 1in = 0.083 ft

$\frac{\pi(0.083)^2}{4} = \frac{0.00545\ ft^2}{0.545\ ft} = 0.01$

Orifice diameter 7.0 in
A: 0.583

$\frac{\pi(0.583)^2}{4} = \frac{0.267\ ft^2}{0.545} = 0.489$

$= \frac{\left(\frac{qv}{A_2}\right)^2\left(1-\left(\frac{A_2}{A_1}\right)^2\right)}{2g}$

$\frac{\left(\frac{0.0557}{0.00545}\right)\left(1-(0.01)^2\right)}{2(9.81)}$

$= 0.521\ ft$ for 1in diameter

(0.83)

$= 0.632\ ft$

$\frac{\left(\frac{0.0557}{0.267}\right)\left(1-(0.489)^2\right)}{2(9.81)}$

$= \frac{0.00809\ ft}{(0.83)} = 0.0067\ ft$

for 7in diameter

9) 5-in Type K copper-tube Unseed oil at 77°F.

flow rate 700 gal/min - 1000 gal/min, Manometer scale ranges 0 - 8.0 in of mercury

flow nozzle $C = 0.997 - 6.53\sqrt{\beta/N_R}$

$\beta = 0.50$

5-in type K copper-tube $1.259 \times 10^{-1}\ ft^2$
from table Appen. H pg. 505

linseed
sg =

Manometer mercury: (13.54)(62.

= 84

$V_1 = C \times \sqrt{\frac{2(9.81)(h)\left(\frac{\gamma_m}{\gamma_w} - \right.}{\left(\frac{A_1}{A_2}\right)^2 - 1}}$

15) Pilot-static tube is inserted into a duct at a temp of 50°C, Differential manometer ready

Calculate velocity flow

$410\ lb/ft^3$)

$14.9\ lb/ft^3$

)

50°C, Differential manometer reay
0.24 in of water, Calcu velocity flow

$$0.24\text{in} = \frac{6.096\text{mm}}{1000} = 0.006096$$

$$\Delta h = 0.006096\left(\frac{1000}{1.2} - 1\right)$$

$$\Delta h = 5.074$$

$$V = \sqrt{(2)(9.81)(5.074)}$$

$$= 9.10\ \text{M/S}$$