ERRATA for

PE Control Systems Practice Exam

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Errata posted 11/01/2024

Revisions are shown in red.

Solution 14, p. 60:

$$\text{Re} = \frac{\rho V D}{\mu}$$

where

ρ = density

V = velocity in pipe

D = pipe inner diameter

μ = viscosity

$$V = \frac{Q}{A} \qquad A = \pi\left(\frac{D}{2}\right)^2$$

SG is defined relative to water

$\rho_{water} \approx 62.4$ lbm/ft^3

D (1-in., Sch. 80) = 0.957 in.

$$A = \frac{(3.14159)(0.957)^2}{4} = 0.719 \text{ in}^2$$

$$V = \left(\frac{100 \text{ gal}}{\text{min}}\right)\left(\frac{231 \text{ in}^3}{1 \text{ gal}}\right)\left(\frac{1}{0.719 \text{ in}^2}\right) = 32{,}128 \text{ in./min}$$

$$\text{Re} = \left(\frac{62.4 \text{ lbm}}{\text{ft}^3}\right)\left(\frac{32{,}128 \text{ in.}}{\text{min}}\right)\left(\frac{0.957 \text{ in.}}{1}\right)\left(\frac{1}{1.0 \text{ cP}}\right)\left(\frac{\text{ft-hr}}{2.42 \text{ lbm}}\right)\left(\frac{60 \text{ min}}{\text{hr}}\right)\left(\frac{\text{ft}^2}{144 \text{ in}^2}\right)$$

$$\text{Re} = 3.45 \times 10^5$$

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Solution 15, p. 60:

$\Delta P = (SG_1 \times H_H + SG_1 \times H_W - (SG_f \times H_{H+W})$

This application is a wet-leg standard DP transmitter with a fill pot. It is not a capillary DP level transmitter, and therefore the high side H is exposed to the process liquid SG_1, and the low side L is filled with SG_f from the fill seal pot.

Span (tank is full):

Span = (1.0 × 1,200 mm + 1.0 × 300 mm) – [(0.95 × (1,200 mm + 300 mm)]

= 1,500 – 1,425 mm H_2O

= +75 mm H_2O

Zero (tank is empty):

Zero = (0 × 1,200 mm + 1.0 × 300 mm) – [(0.95 × (1,200 mm + 300 mm)]

= 300 – 1,425 mm H_2O

= –1,125 mm H_2O

Therefore, the range (zero to span) is –1,125 to +75.