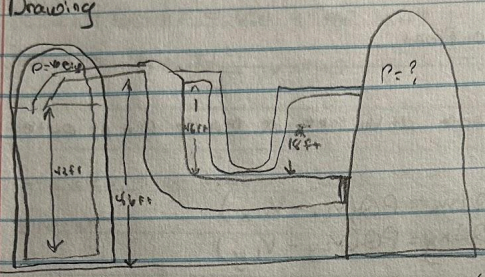
3/15/24

Syncere Butlin

2nd Test

A. Drawing



1.) Purpose = what is the magnitude and location on a blind flange to be installed on the opposite side of the pipeline on the right?

Design C. = The blind flange is installed on the opposite side, pipeline has zero velocity.

Procedure: $F_R = \rho(\frac{h}{2})A$, $A = \pi r^2$, $h = 16$, $d = 2$ in, $Q = 150$ gpm

$\rho = 49.01$ lb/ft^3

Variables: blind flange is 2 inches in diameter, the flow ethyl alcohol is 150 gpm

Solution/calculations:

$A = \pi r^2 = 3.14(1)^2 = \pi = 3.14$ in $\rightarrow 0.26$ ft

$F_R = \rho(\frac{h}{2})A = 49.01(\frac{16}{2})(0.26) = \boxed{115 \text{ ft}^3}$

Location $\sin(\frac{16}{36}) = \boxed{0.0072^\circ}$

2. Purpose: Calculate the total horizontal and vertical forces in the whole pipe elbows valve system (from point to point)

Drawing: Pic A on front

Design: Need pressure at the inlet of pipeline and at outlet of the pipeline

Procedure: $F_x = PQ\Delta v_x = PQ(v_{2x} - v_{1x})$

$F_y = PQ\Delta x_y = PQ(v_{2y} - v_{1y})$

Variables: $p = 40$ psig, $h/2$, $h = 38$ ft, from gate valve 15 ft

Solution: $F_x = PQ\Delta\Delta v_x = PQ(v_{2x} - v_{1x})$

equation for $F_x = 40(150)(0-2) = -12000$ lb$_x$

$F_y = PQ\Delta x_x = 40(150)(2-0) = 12{,}000$

3. Purpose: Pressure drop across the nozzle?

Drawing: Pic A

Design: Proposed to use a flow nozzle to measure the flow.

Procedure: $A = \frac{\pi d^2}{4}$, $v = f(Q)$

Variables: Pipe diameter Ratio = 0.5

Solution:

4. Purpose: If the pipe closes suddenly, what is pressure increment after sudden closing?

Drawing: Pic A

Design: have to use equation 11-4 in the book, and compare thickness, also see if no cavitation in the system.

Variable: modulus of elasticity of steel is 200 GPa,

Solution:

Source: Chapter 11

Procedure: $t = \frac{PD}{2(\sigma E + PY)}$