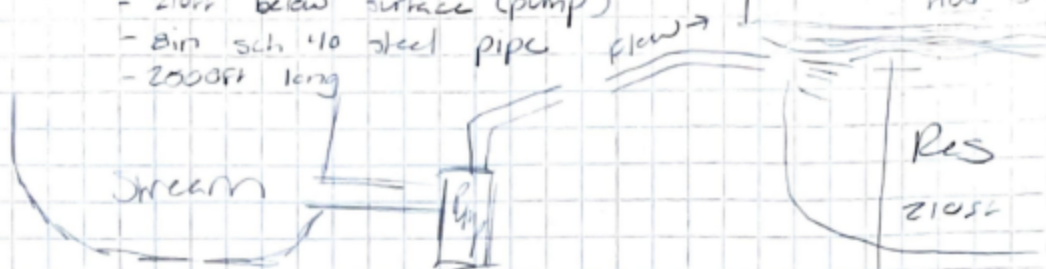


8-46

- 60°F water
- 210ft below surface (pump)
- 8in sch 40 steel pipe
- 2000ft long



- 4.001 ^{3/2} pressure being pumped, complete
- consider © effect of pump friction loss; neglect others

$$V = \frac{Q}{A}$$

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$$= \underline{41.00913/2}$$

0.3 KPa^2

$$= 11.5 \text{ ft/s}$$

$$N_R = (11.52)(0.6667)$$

1.21×10^{-5}

$$= 6.33 \times 10^{-7}$$

$$\underline{0.6451} = 64.54\%$$

1.5×10^{-5}

$$f = 0.0155$$

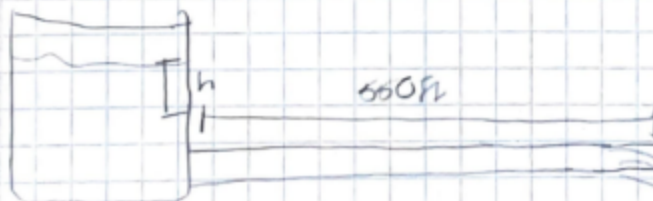
$$h_2 = \int \frac{1}{\rho} \cdot \frac{V_2}{v_2} = (0.51 \text{ m}) \left(\frac{2000}{0.51 \text{ m}^3/\text{s}} \right) \left(\frac{11.025}{2(50.2)} \right)$$

$$= 120 \text{ mm}$$

$$= 120 \text{ cm/s}$$

8-33

- 80°F water
 - 500 ft 6 in sch 40 steel pipe
 - take energy loss into account due to friction
 - calculate head above pipe inlet - produce
- $Q = 2.5017 \text{ s}$



$$\frac{P_1}{\gamma} + \frac{V_1^2}{2g} + z_1 = \frac{P_2}{\gamma} + \frac{V_2^2}{2g} + z_2 + h_L$$

$$h = \frac{V_2^2}{2g} + h_L$$

$$h = \left(\frac{12.5}{2(57.3)} \right)^2 \left(1 + 0.016 \left(\frac{550}{0.0001} \right) \right)$$

$$= 2.41 \left(\frac{18.41}{44.41} \right)$$

$$= 1.0$$

$$V_2 = \frac{Q}{A} = \frac{2.5}{\frac{\pi}{4} \left(\frac{8}{16} \right)^2} = 12.5 \text{ ft/s}$$

$$Re = \frac{VD}{\nu} = \frac{(12.5)(0.0001)}{9.15 \times 10^{-5}}$$

$$\frac{D}{E} = \frac{0.0001}{1.5 \times 10^{-4}}$$

$$= 333.3$$

$$f \approx 0.016$$

10-20

- contraction from DN 125
- sch-80 steel pipe → sch-80 pipe
- $Q = 550 \text{ gpm}$
- Energy loss?



$$h_L = K(V^2)$$

$$= (0.35) \left(\frac{4.37^2}{2(5.81)} \right)$$

$$= 0.375 \text{ m}$$

$$\frac{D_1}{D_2} = \frac{122.3}{49.3} \approx 2.48$$

$$V_2 = \frac{Q}{A_2} = \frac{550}{1.5 \times 10^{-2}} \left(\frac{1 \text{ m/s}}{60000 \text{ ft/min}} \right)$$

$$= 4.88 \text{ m/s}$$

$$V \approx 0.38$$

10-39

- see
- find pressure @ outlet of pump to be measured
- no flow line leading to gage
- compute energy loss
- 0.40, 3 in. water @ 50°F
- 3 in. sch-80 pipe



$$h_L = (0.018)(20) \left(\frac{17.7^2}{64.4} \right)$$

$$= 0.354 \text{ ft}$$

$$V = \frac{Q}{A}$$

$$= \frac{0.40}{\frac{\pi}{4} \left(\frac{3}{12} \right)^2}$$

$$= 7.79 \text{ ft/s}$$

$$\frac{L}{D} = 20$$

$$f_T = 0.018$$