Name: Shokunla, Emmanuel

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1. $Re = ?$ 785N of oil, $t = 25$ seconds

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

$\rho = 785 kgm^{-3}$

$F = mg$

$m = F/g$

$m = 785/9.81$

$m = 80kg$

$m = 80/25 = 3.20 kgs^{-1}$

$m = \rho V A$

where $A = \frac{\pi D^2}{4}$

$\rho = 900 kg/m$

$\frac{\pi (0.12)^2}{4} = 0.0113 m^2$

$V = m/\rho A$

$= \frac{3.20}{(0.113 \times 900)}$

$V = 0.314 ms^{-1}$

$Re = \frac{900 \times 0.12 \times 0.314}{0.09}$

$Re = 376.8$

$\therefore$ The flow is laminar $Re < 2000$

$$\Delta P = \frac{32 \mu v L}{D^2}$$

$$\frac{32 \times 0.09 \times 0.314 \times 12}{(0.12)^2}$$

$$P = 753.6 \, N/m^{-2}$$

$$P = \rho g h$$

$$h = \frac{P}{\rho g} = \frac{753.6}{900 \times 9.81}$$

$$h = 0.0853 m$$

2 $D = 0.06m$

$P = 1000 kgm^{-3}$, $\nu = 850m$

$Q = 8.5 l/10^6 = 8.5 \times 10^{-3} m^3/s$

$\nu = 0.5 \, stroke = 0.5 \times 10^{-5} m^2/s$

$\mu = \nu\rho = .5 \times 10^{-5} \times 1000$

$= 5 \times 10^{-2} \, N/m^{-1}$

$Q = UA$

$A = \frac{Q}{U} = \frac{\pi (0.06)^2}{4} = 2.827 \times 10^{-3} m^2$

$U = \frac{8.5 \times 10^{-3}}{2.83 \times 10^{-3}}$

$= 3.01 m^{-1}$

1 $\Delta P = \frac{32 \mu v L}{D^2} = \frac{32 \times 0.05 \times 3.01 \times 850}{(0.06)^2}$

$\Delta P = 1130 kN/m^2$

$P = \rho g h$

$h = \frac{P}{\rho g} = \frac{1130 \times 10^3}{1000 \times 9.81}$

$h \cong 110 m$

b $\tau = \mu \frac{\delta v}{\delta y}$

$\tau = -\left(\frac{\delta p}{\delta x}\right) \cdot \frac{r}{2}$

$r = D/2 = \frac{0.06}{2} = 0.03m$

$\left(\frac{\delta p}{\delta x}\right) = \frac{-1130 \times 10^{-3}}{850}$

$= -\left(\frac{-1130 \times 10^{-3}}{850}\right) \times \frac{0.03}{2}$

$\tau = 20 N/m^2$

c $Re = \frac{\rho v D}{\mu}$

$= \frac{1000 \times 3.01 \times 0.06}{0.05}$

$Re = 3612$ $\quad Re > 2900$

$\therefore$ Flow is turbulent