3. Diameter of Pipe $= d_1 = 30cm$

$$A_1 = \frac{\pi d_1}{4} = \frac{\pi (30)^2}{4} = 706.86cm^2$$

Differential head (h) $= \left[\frac{13.6}{0.9} - 1\right] \times 50$ cm of oil

$= 705.556$cm of oil.

$$Q = \frac{C_d \times A_d A_p \times \sqrt{2gh}}{\sqrt{A_p^2 - A_0^2}}$$

$$= \frac{0.64 \times 176.714 \times 706.858 \times \sqrt{2 \times 9.81 \times 705556}}{\sqrt{706.858^2 - 176.714^2}}$$

$= 0.64 \times 182.509 \times 117.656$

$= 13742.96 cm^3/sec$

$= 13.74296$ lits/sec

4. Difference of mercury level $x = 170mm = 0.17m$

Sp.gr of mercury $S_g = 13.6$

Sp.gr of sea water $=$ ~~10.26~~ 1.026

$$\therefore h = x\left[{}^{Sg}/_{Sw} - 1\right] = 0.17\left[{}^{13.6}/_{1.0.26} - 1\right]$$

$= 2.0834$

Using $V = \sqrt{2gh}$

$V = \sqrt{2 \times 9.81 \times 2.083} = 6.393m/s$

Converting to Km/hr

$$\frac{6.393 \times 60 \times 60}{1000} = 23 Km/hr.$$

$\ldots m = 1m$

$10^3 dm^3 = 1 m^3$

$1000 dm^3 = 1m^3$

$5 dm^3 = ?$

$? = 5/1000 = 0.005$

Volumetric flow rate $= 0.005 m/min$

Actual Flow rate $= \frac{0.005}{60} = 8.33 \times 10^{-5} m^3/sec$

Speed = 1700 rpm

changing into rps

$\frac{1700}{60} = 28.33 rev/sec$

$\partial p = 15 bar \equiv 15 \times 10^5 N/m^2$

Norminal displacement $= 10 cm^3/rev$

Note that $100^3 cm^3 = 1m^3$

$10 cm^3 = x$

$x = \frac{10}{100^3} = 1 \times 10^{-5} m^3/rev$

Flow rate = Norminal $\times$ speed

$= 28.33 \times 1 \times 10^{-5}$

$= 2.833 \times 10^{-4}$

a) volume Efficiency $= \frac{\text{Actual Flow rate}}{\text{Rated Flow rate}} \times 100\% = \frac{8.33 \times 10^{-5} \times 100}{2.833 \times 10^{-4}} = 29.4\%$

b) Fluid power $= Q \cdot dp = 8.33 \times 10^{-5} \times 15 \times 10^5$ ~~= 29.4~~

$= 124.95 Nm/sec$

c) shaft power = $T\omega$

$T = 15 Nm$

$\omega = 2 \times 22/7 \times 28.33$

$= 178.07 rad/sec$

d) Overall Efficiency $= \frac{\text{Fluid Power}}{\text{shaft power}} \times 100\% = \frac{124.95}{2671.05} \times 100$

$= 4.67\%$

5. Volumetric Flow rate

changing from dm^3/min to m^3/min

$10dm = 1m$

$10^3 dm^3 = 1^3 m^3$

$1000 dm^3 = 1m^3$

$5dm^3 = ?$

$? = 5/1000 = 0.0005$

Volumetric Flow rate = $0.005 m/min$

Actual Flow rate = $\frac{0.005}{60} = 8.33 \times 10^{-5} m^3/sec$

Speed = 1700 rpm

changing rps

$\frac{1700}{60} = 28.33 rev/sec$

$\partial p = 15 bar \equiv 15 \times 10^5 N/m^2$

Norminal displacement = $10cm^3/rev$

Note that $100^3 cm^3 = 1m^3$

$10cm^3 = x$

$x = \frac{10}{100^3} = 1 \times 10^{-5} m^3/rev$

Flow rate = Norminal $\times$ speed

$= 28.33 \times 1 \times 10^{-5}$

$= 2.833 \times 10^{-4}$

Actual Flow rate $\times 100\% = 8.33 \times 10^{-5} \times$

$\frac{P_2}{\rho g}$ = - 30cm of mercury, S.g Hg = 13.6

$\frac{P_2}{\rho g}$ = -30×10^{-2} m of mercury $\times$ 13.6

= -4.08 m

let Differential Head = $H_d = \frac{P_1}{\rho g} - \frac{P_2}{\rho g}$

$= 18 - (-4.08)$

$= 18 + 4.08 = 22.08 \times 100$

$H_d = 2208$

using $Q = \frac{C_d \sqrt{2gh} \cdot A_1 A_2}{\sqrt{A_1^2 - A_2^2}}$

$= \frac{0.98 \times \sqrt{2 \times 981 \times 2208} \times 314.16 \times 78.54}{\sqrt{(314.16)^2 - (78.54)}}$

$= \frac{0.98 \times 2081.37 \times 24674.1264}{304.184112}$

$= 165455.3 \text{ cm}^3/s$

$= \frac{165455.3}{1000} = 165.455$ lit/sec

metric Flow rate
nging From dm^3/min to m^3/min
10dm
10^3 d
1000
5d
? =
etric
d
e
n
2. let Inlet Diameter = D_1 = 20cm

let throat diameter = D_2 = 10cm

let Inlet Area = $A_2 = \frac{\pi D^2}{4} = \frac{\pi (10)^2}{4} = 78.54 cm^2$

Density of water, ρ = $1000 Kg/m^3$

Pressure of Inlet = 17.658 = $17.658 \times 10^4 N/m^2$

$\therefore \frac{P_1}{\rho g} = \frac{17.658 \times 10^4}{1000 \times 9.81} = 18m$

$\frac{P_2}{\rho g} = -30cm$ of mercury, S.g Hg = 13.6

$\frac{P_2}{\rho g} = -30 \times 10^{-2} m$ of mercury $\times 13.6$

$= -4.08m$

let Differential Head = $H_d = \frac{P_1}{\rho g} - \frac{P_2}{\rho g}$

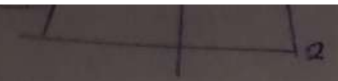
$= 18 - (-4.08)$

$= 18 + 4.08 = 22.08 \times 100$

$H_d = 2208$

using $Q = \frac{C_d \sqrt{2gh} \cdot A_1 A_2}{\sqrt{A_1^2 - A_2^2}}$

$\times 78.54$



$L = 2.0$

The velocity flow at smaller end = $V_1 = 5 m/s$

The velocity flow at larger end = $V_2 = 2 m/s$

let the Pressure at the smaller end = P_s = 2.5m of liquid.

let the Pressure loss of head = $H_L = \frac{0.35(V_1 - V_2)^2}{2g}$

$$= \frac{0.35(5-2)^2}{2 \times 9.81} = 0.161 m$$

let the Pressure head at the lower end = $P_L = ?$

Applying Bernoullis Equation

$$\frac{P_1}{\rho g} + \frac{V_1^2}{2g} + Z_1 = \frac{P_2}{\rho g} + \frac{V_2^2}{2g} + Z_2 + H$$

Where $P_s = \frac{P_1}{\rho g}$ and $P_L = \frac{P_2}{\rho g}$

$Z_1 = 2.0$ and $Z_2 = 0$ (datum line passes through section 2)

Inputting Values into the equation

$$2.5 + \frac{5^2}{2 \times 9.81} + 2.0 = P_L + \frac{2^2}{2 \times 9.81} + 0 + 0.161$$

$$2.5 + \frac{25}{19.62} + 2 - \left(\frac{4}{19.62} + 0.161\right) = P_L$$

$$5.774 - 0.365 = P_L$$

$P_L = 5.409m$ of Fluid.

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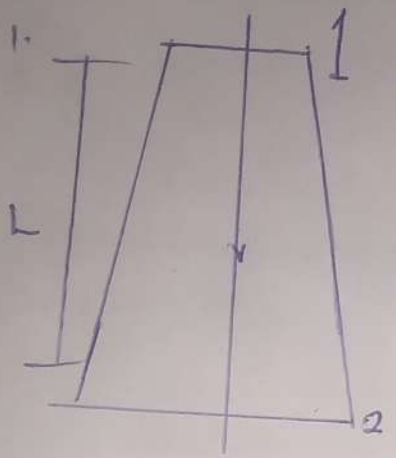
18/ENG02/085
Computer Engineering.

1.



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Applying Bernoullis Equation

$$\frac{P_1}{\rho g} + \frac{V_1^2}{2g} + Z_1 = \frac{P_2}{\rho g} + \frac{V_2^2}{2g} + Z_2 + H$$