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18/ENG03/040
Civil Engineering

1 L = 2.0
Velocity flow of smaller end $v_1 = 5 m/s$
Velocity flow at larger end $v_2 = 2 m/s$

Let the loss of head $= \frac{0.32(v_1 - v_2)^2}{2g}$

$= 0.16 m$

Apply Bernouili's method

$\frac{P_1}{\rho g} + \frac{v^2}{2g} + z_1 = \frac{P_2}{\rho g} + \frac{v^2}{2g} + z_2 + h_L$

where $P_s = \frac{P_1}{\rho g}$ $\quad P_e = \frac{P_2}{\rho g}$

$2.5 + \frac{25}{19.62} + 2 = P_2 + \frac{4}{19.62} + 0.161$

$5.774 - 0.365 = P_2$

$P_2 = 5.409 m$

2. $D_1 = 20cm$ $\quad A_1 = 314.16 cm^2$
$D_2 = 10cm$ $\quad A_2 = 78.54 cm^2$
$P = 1000 kg/m^3$

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

$\frac{P_2}{\rho g} = 30 \times 10^{-2} \times 13.6$
$= 4.08 m$

Let differential head $= \frac{P_1}{\rho g} - \frac{P_2}{\rho g}$

$= 18 + 4.08 = 22.08 \times 100$

$H_2 = 2208\,cm$

$= 0.98 \dfrac{\sqrt{2 \times 9.81 \times 2208} \times 314.16 \times 78.54}{\sqrt{(314.16)^2 - (78.54)^2}}$

$= 165455.3\ cm^3/s$

3 $d_1 = 30$ $A = 706.86\,cm^2$

$d_2 = 15$ $= 176.72\,cm$

Specific gravity of oil = 0.9

" " " of mecury = 13.6

Differencial manometer reading $x = 50\,cm$

discharge = 0.64

$h = 50\left(\dfrac{13.6}{0.9} - 1\right)$

$h = 705.56\,cm$ of oil

$Q = 0.64 \times \dfrac{\sqrt{2 \times 981 \times 705.56} \times 706.86 \times 176.72}{\sqrt{(706.86)^2 - (176.72)}}$

$Q = \dfrac{137243.29}{1000} = 137.2429\ lit/sec$

4) Specificgravity of mecury = 13.6

" " of water = 1.026

mecury load = 170 mm $V = ?$

$h = 0.17\left[\dfrac{13.6}{1.026}\right] - 1 = 2.0834\,m$

$V = \sqrt{2gh} = 6.393\ m/s$

$V = \dfrac{6.393 \times 60^2}{1000} = 23.01\ km/hr$