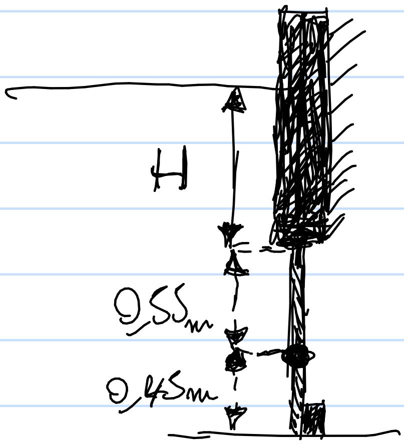


APERTURA QUANDO $y_{cp} < H + 0{,}55$

$$F = \int_0^L \rho g (H+l)\, b\, dl$$

$$= \rho g b \int_0^L (H + l)\, dl$$

$$= \rho g b \left[ H l + \frac{l^2}{2} \right]_0^L$$

$$= \rho g b \left( H L + \frac{L^2}{2} \right) =$$

$$= \rho g b L \left( H + \frac{L}{2} \right)$$

$$M = \int_0^L \rho g (H+l)\,(l - 0{,}55L)\, b\, dl$$

$$= \rho g b \int_0^L Hl + l^2 - 0{,}55LH - 0{,}55Ll \; dl$$

$$= \rho g b \left[ H\frac{l^2}{2} + \frac{l^3}{3} - 0{,}55LHl - 0{,}55L\frac{l^2}{2} \right]_0^L$$

$$= \rho g b \left[ H\frac{L^2}{2} + \frac{L^3}{3} - 0{,}55L^2H - 0{,}55\frac{L^3}{2} \right]$$

$$= 8\sigma b \left[ H\frac{L^2}{2} + \frac{L^3}{3} - 0{,}55 L^2 H - 0{,}55\frac{L^3}{2} \right]$$

$$= 8\sigma b L^2 \left( \frac{H}{2} - 0{,}55 H + \frac{L}{3} - \frac{0{,}55}{2} L \right)$$

$$M < 0$$

$$\frac{H}{2} - 0{,}55 H + \frac{L}{3} - \frac{0{,}55}{2} L < 0$$

$$\left( \frac{1}{2} - 0{,}55 \right) H < L \left( \frac{0{,}55}{2} - \frac{1}{3} \right)$$

$$-0{,}05 H < L \left( \frac{1{,}65 - 2}{6} \right)$$

$$-0{,}05 H < L \left( \frac{-0{,}35}{6} \right)$$

$$H > L \, \frac{0{,}35}{0{,}05} \, \frac{1}{6}$$

$$H > L \, \frac{35}{5} \, \frac{1}{6}$$

$$H > \frac{7}{6} L$$

$$y_{cp} = y_c + \frac{I_B}{y_c A}$$

$$= H + 0{,}5L + \frac{\frac{1}{12}L^3 b}{(H + 0{,}5L)\, L b}$$

$$y_{cp} < H + 0{,}55L$$

$$\cancel{H} + \cancel{0{,}5L} + \frac{\frac{L^3 b}{12}}{(H + 0{,}5L)\, \cancel{L} b} < \cancel{H} + 0{,}55L$$

$$\frac{L^{\cancel{3}} \cancel{b}}{12} < (H + 0{,}5L)\, \cancel{L}\cancel{b}\; 0{,}05\cancel{L}$$

$$\frac{L}{12} < \left(H + \frac{1}{2}L\right) \frac{5}{100}$$

$$\frac{L}{12} < \left(H + \frac{1}{2}L\right) \frac{1}{20}$$

$$\frac{H}{20} > \frac{L}{12} - \frac{L}{40}$$

$$H > L\left(\frac{20}{12} - \frac{1}{2}\right) = L\,\frac{20 - 6}{12}$$

$$= \frac{14}{12} = \frac{7}{6}L$$

ANALISI DIMENSIONALE

$$\Delta P = f(r, t, U, E)$$

$$[\Delta P] = \frac{kg}{m s^2}$$

$[R] = m$ = DISTANZA DAL CENTRO

$[t] = s$ = TEMPO

$[U] = m/s$ = VEL. SUONO

$[E] = \frac{kg\, m^2}{s^2}$ = ENERGIA SPRIGIONATA

5 VAR
3 DIM $\Rightarrow$ 2 GRUPPI $\pi_i$

VAR RIPETUTE

$r, U, E$
$r, t, E$
$t, U, E$

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CON $r, U, E$ / $r, t, E$ OTTENGO

$$\pi_1 = \frac{\Delta P\, r^3}{E}$$

$$\pi_2 = \frac{t U}{r}$$

---

CON $t, U, E$ OTTENGO

$$\pi_1 = \frac{\Delta P\, t^3 U^3}{E}$$

$$\pi_2 = \frac{t U}{r}$$

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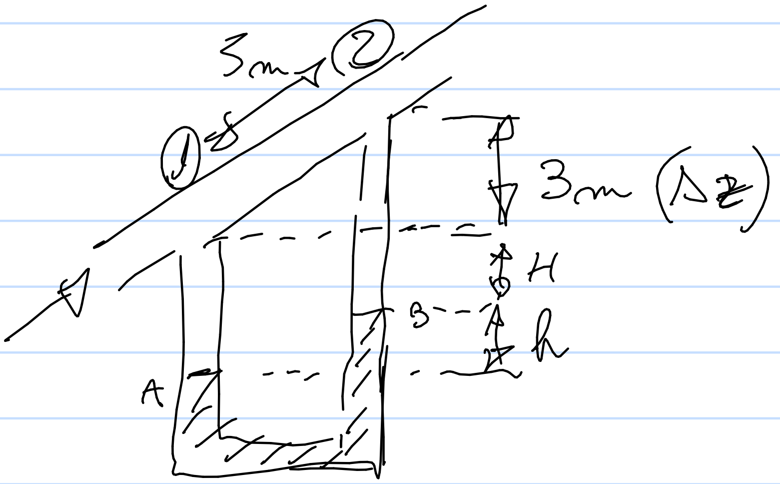
SE E RADDOPPIA ANCHE P RADDOPPIA




$$P_{1A} = P_1 + \rho_{H_2O}\, g\, (H + h)$$

$$P_{2A} = P_2 + \rho_{H_2O}\, g\, (H + \Delta z) + \rho_{Hg}\, g\, h$$

$$P_1 + \rho_{H_2O}\, g\, (H + h) = P_2 + \rho_{H_2O}\, g\, (H + \Delta z) + \rho_{Hg}\, g\, h$$

$$P_1 - P_2 = (\rho_{Hg} - \rho_{H_2O})\, g\, h + \rho\, g\, \Delta z$$

$$= 46089\ Pa$$

BERNOULLI GENERALIZZATO TRA 1 e 2

$$\frac{P_1}{\rho} + \cancel{\frac{v_1^2}{2}} + g z_1 = \frac{P_2}{\rho} + \cancel{\frac{v_2^2}{2}} + g z_2 + \frac{\Delta P_R}{\rho}$$

DOVE $\rho = \rho_{H_2O}$

$$\frac{\Delta P_R}{\rho} = \frac{P_1 - P_2}{\rho} - g\, \Delta z$$

$$h_f = \frac{\Delta P_f}{\rho_{H_2O}\, g} \simeq 0{,}17 \text{ m}$$

$$\Delta P_f = f \frac{L}{D} \rho \frac{U^2}{2}$$

$$f = \Delta P_f \frac{D}{L} \frac{2}{\rho U^2} = 0{,}025$$

$$Re = \frac{\rho U D}{\mu} = 270\cdot000$$

$$\frac{\varepsilon}{D} = f(Re, f) = 0{,}002$$