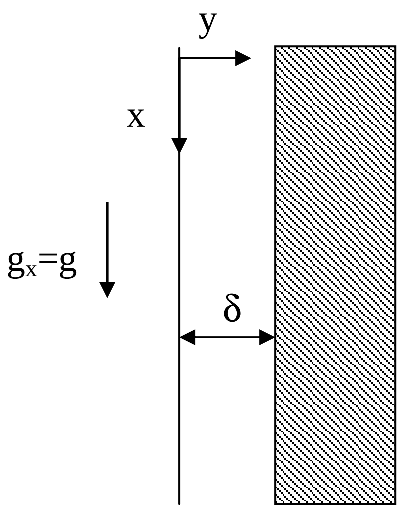
Svolgimento (1)



$$0 = \frac{\partial p}{\partial x} + g + \frac{1}{\rho}\frac{\partial \tau_{xy}}{\partial y}$$

$$0 = \frac{\partial p}{\partial y} \Rightarrow p \neq p(y)$$

quindi $\frac{\partial p}{\partial x} = \frac{dp}{dx} \neq f(y)$

$$\left.\frac{dp}{dx}\right|_{y=0} = 0 \Rightarrow \frac{dp}{dx} = 0$$

$$0 = g + \frac{1}{\rho}\frac{\partial \tau_{xy}}{\partial y}$$

$$\left.\tau_{xy}\right|_{y=0} = 0$$

$$u(\delta) = 0$$

$$\tau_{xy}(y) = \rho g y$$

$$\max\left(\tau_{xy}(y)\right) = \tau_{xy}(\delta) = \rho g \delta$$

$$\text{no flow} \Rightarrow \delta_{\text{no flow}} = \tau_0 / \rho \cdot g = \frac{10}{1500 \cdot 9.81} \cong 6.8 \cdot 10^{-4}\,\text{m}$$

se δ=2 mm

$$u_{\max} = \frac{1}{2\eta}\left(-\frac{\Delta \wp}{\Delta x}\right)\left(\delta - \delta_{\text{no flow}}\right)^2 = \frac{1}{2 \cdot 10}\left(1500 \cdot 9.81 \cdot 2 \cdot 10^{-3} - 10\right) = 0.97\ \text{m/s}$$

$$u(y) = \frac{1}{2\eta}\left(-\frac{\Delta \wp}{\Delta x}\right)\left[\left(\delta - \delta_{\text{no flow}}\right)^2 - \left(y - \delta_{\text{no flow}}\right)^2\right] \quad y > \delta_{\text{no flow}}$$

$$M = \rho W \int_0^{\delta_{\text{no flow}}} u_{\max}\, dy + \rho W \int_0^{\delta - \delta_{\text{no flow}}} \left[\frac{1}{2\eta}\left(-\frac{\Delta \wp}{\Delta x}\right)\left(y - \left(\delta - \delta_{\text{no flow}}\right)\right)^2\right] dy$$

Svolgimento (2)

$$v_x = -\frac{\partial \psi}{\partial y}$$

$$v_y = +\frac{\partial \psi}{\partial x}$$

$$\psi(x,y) = \int (-v_x) dy + C_1(x) = \int -A(x - By) dy + C_1(x) = A\left(-xy + B\frac{y^2}{2}\right) + C_1(x)$$

$$\psi(x,y) = \int v_y dx + C_2(y) = \int A(-y - Bx) dx + C_2(y) = A\left(-xy - B\frac{x^2}{2}\right) + C_2(y)$$

$$A\left(-xy + B\frac{y^2}{2}\right) + C_1(x) = A\left(-xy - B\frac{x^2}{2}\right) + C_2(y)$$

$$\psi(x,y) = A\left(-xy + B\frac{y^2}{2} - B\frac{x^2}{2}\right)$$

$$\text{irrotazionale} \Rightarrow \frac{\partial v_x}{\partial y} - \frac{\partial v_y}{\partial x} = -AB + AB = 0 \text{ ok!}$$

$$\frac{1}{2}\rho\left(v_x^2 + v_y^2\right) + \wp = C$$

$$\frac{1}{2}\rho\left[A^2\left(x^2 + 16y^2 - 8xy\right) + A^2\left(y^2 + 16x^2 + 8xy\right)\right] + \wp = C$$

$$\frac{1}{2}\rho\left[A^2\left(17x^2 + 17y^2\right)\right] + \wp = C$$

$$\frac{17}{2}\rho A^2\left[x^2 + y^2\right] + \wp = \wp_0$$

$$\wp_0 - \wp(R = 1m) = \frac{17}{2}\rho A^2\left[x^2 + y^2\right] = \frac{17}{2}1000\cdot 1^2\left(1^2\right)[=]\frac{kg}{m^3}\frac{1}{s^2}m^2[=]kg\frac{m}{s^2}\frac{1}{m^2}[=]Pa$$

$$\wp_0 - \wp(R = 1m) = \frac{17}{2}1000\cdot 1^2\left(1^2\right)Pa = 7500Pa$$

$$\wp(R = 1m) = \wp_0 - 7500Pa = 17000 - 7500Pa = 7500Pa$$