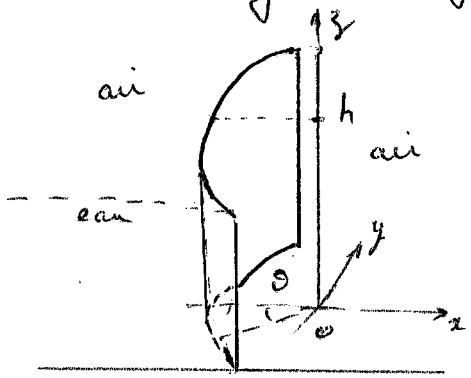
MF132 - Barrage hémi-cylindrique

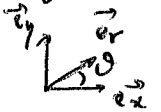


eau : fluide incompressible $\rightarrow p_{eau} = p(z) + \rho g(z-h)$

$$\vec{F} = \iint p_{eau} \cdot dS(-\vec{e_r}) + \iint p_{air}\, dS\, \vec{e_r}$$

$$= \iint [p_0 - \rho g(z-h)] R\, d\theta\, dz (-\vec{e_r}) + \iint p_0 R\, d\theta\, dz\, \vec{e_r}$$

$$= \int_0^{\pi} \int_0^{h} +\rho g R(z-h)\, d\theta\, dz\, \vec{e_r}$$



$\vec{e_r} = \cos\theta\, \vec{e_x} + \sin\theta\, \vec{e_y}$

Symétrie : Plan $(x O z)$ plan de symétrie $\Rightarrow \vec{F} \parallel e_x$

$$F_x = \int_{\pi/2}^{3\pi/2} \int_0^{h} \rho g R(z-h)\, d\theta \cos\theta\, dz = \left[\sin\theta\right]_{\pi/2}^{3\pi/2} \rho g R\left(\frac{h^2}{2} - h^2\right)$$

$$F_x = +\rho g R h^2 \rightarrow \vec{F} = \rho g R h^2 \vec{e_x} \qquad F = 9{,}81\ 10^3\ N$$