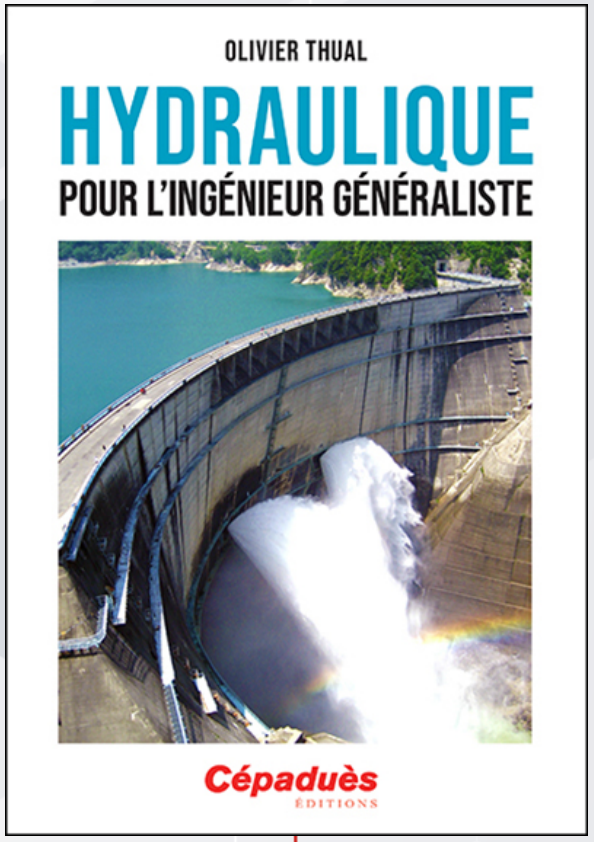
Dans le cadre de la
Formation « Hydraulique Fondamentale »
Unité de Formation pour la Performance Industrielle

EDF

en collaboration avec l'INP-ENSEEIHT

Olivier THUAL
Toulouse INP
ENSEEIHT



INP TOULOUSE ENSEEIHT

Chapitre 1
Hydrostatique

Pression hydrostatique

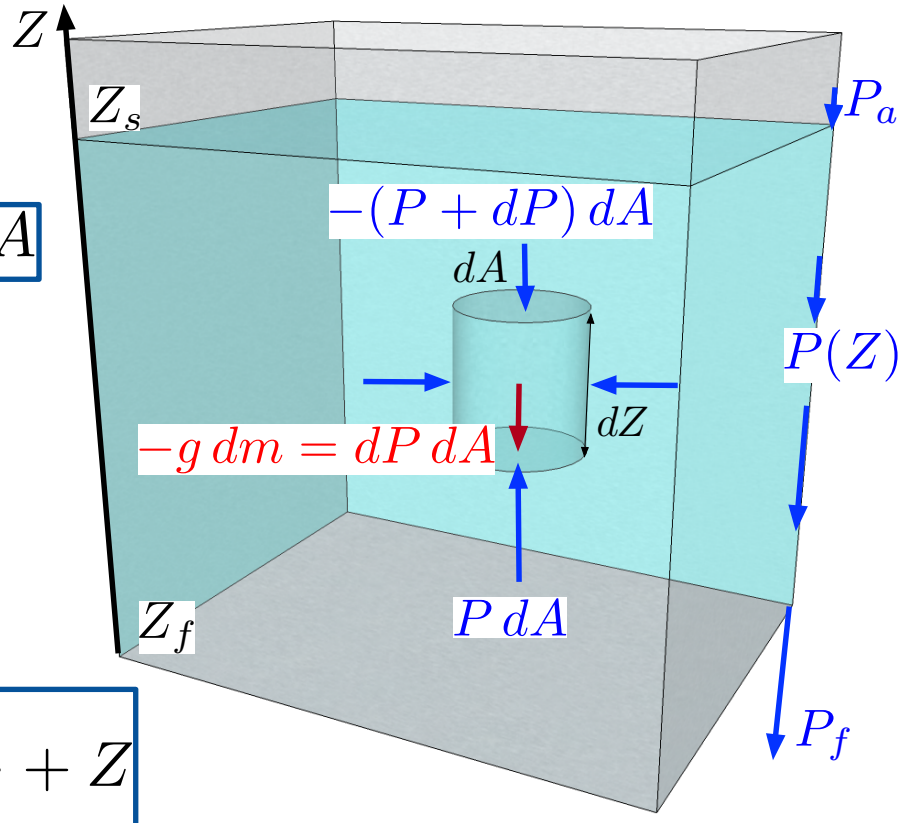
Bilan des forces :

$$0 = -g\,dm + P\,dA - (P + dP)\,dA$$

$$0 = (-\rho\,g\,dZ - dP)\,dA$$

Charge hydraulique constante :

$$\frac{dP}{dZ} = -\rho\,g \quad \Longrightarrow \quad H = \frac{P(Z)}{\rho\,g} + Z$$

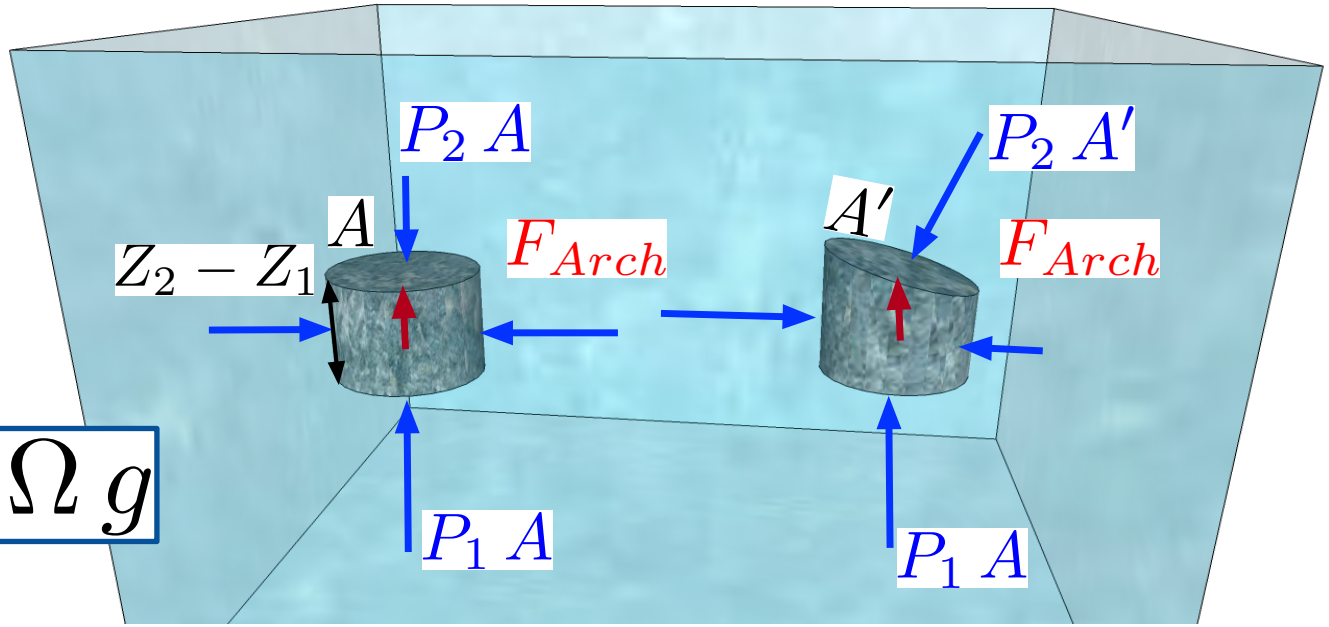


Force d'Archimède

$$H = \frac{P_1}{\rho\, g} + Z_1 = \frac{P_2}{\rho\, g} + Z_2$$

$$\Longrightarrow \quad (P_1 - P_2)\, A = \rho\, g\, (Z_2 - Z_1)\, A = m\, g$$

$$\Omega = (Z_2 - Z_1)\, A$$



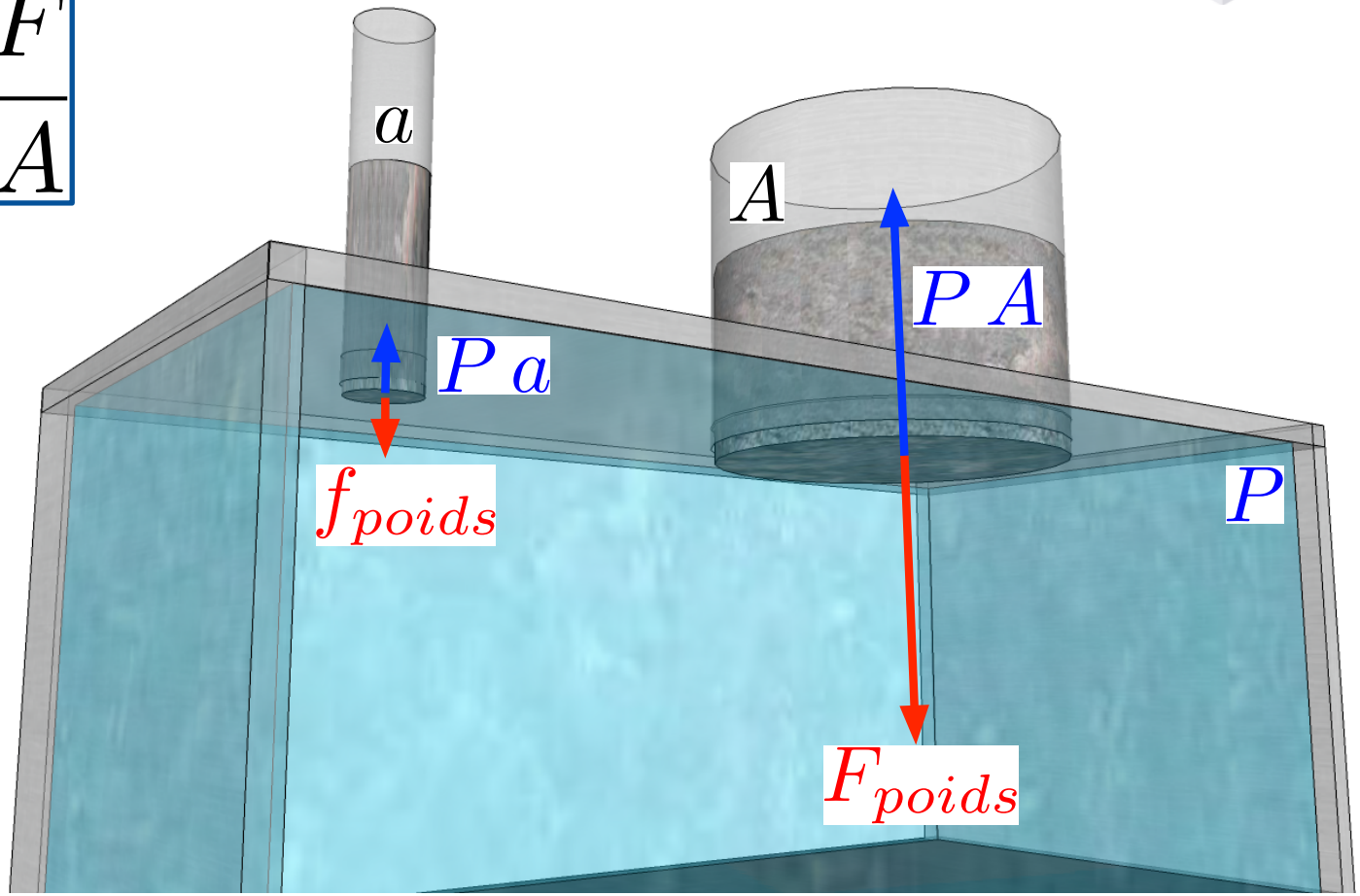
$$F_{Arch} = \rho\, \Omega\, g$$

Principe de Pascal

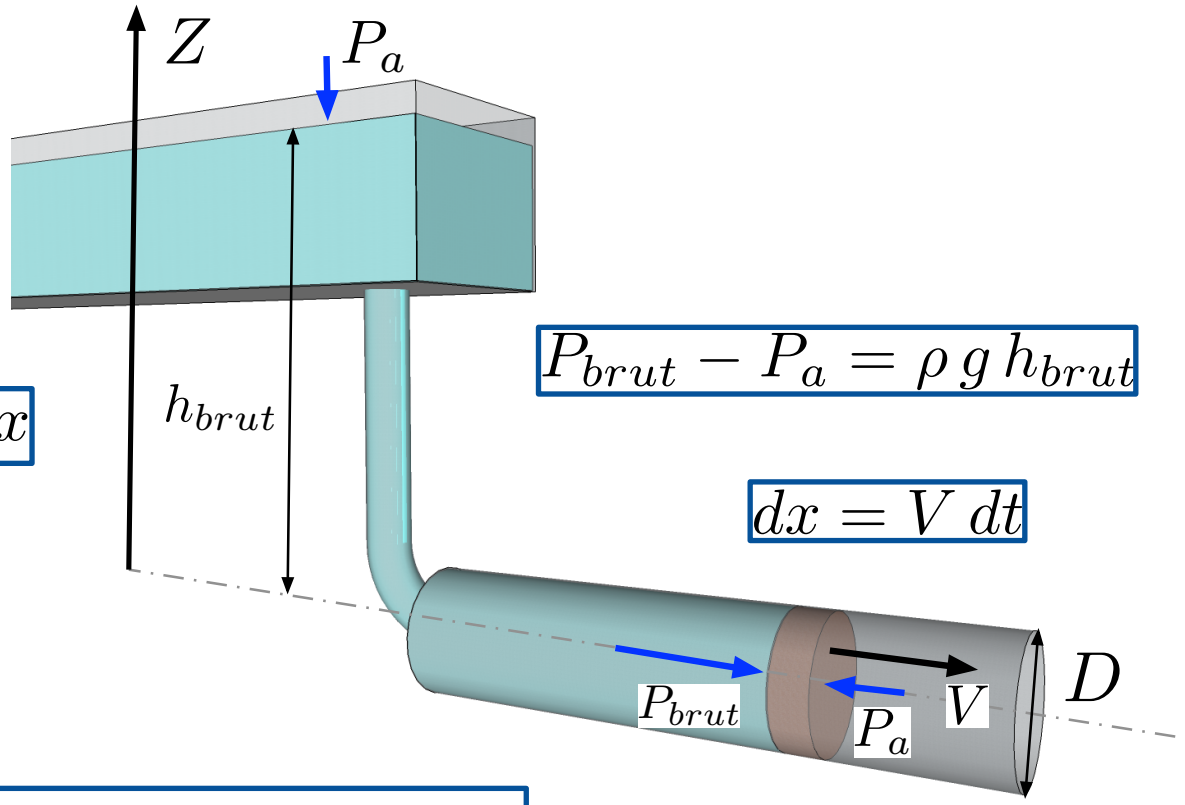
$$P = \frac{f}{a} = \frac{F}{A}$$

$$\Downarrow$$

$$F = f\,\frac{A}{a}$$



Puissance théorique



$$dW = (P_{brut} - P_a)\,A\,dx$$

$$P_{brut} - P_a = \rho\,g\,h_{brut}$$

$$dx = V\,dt$$

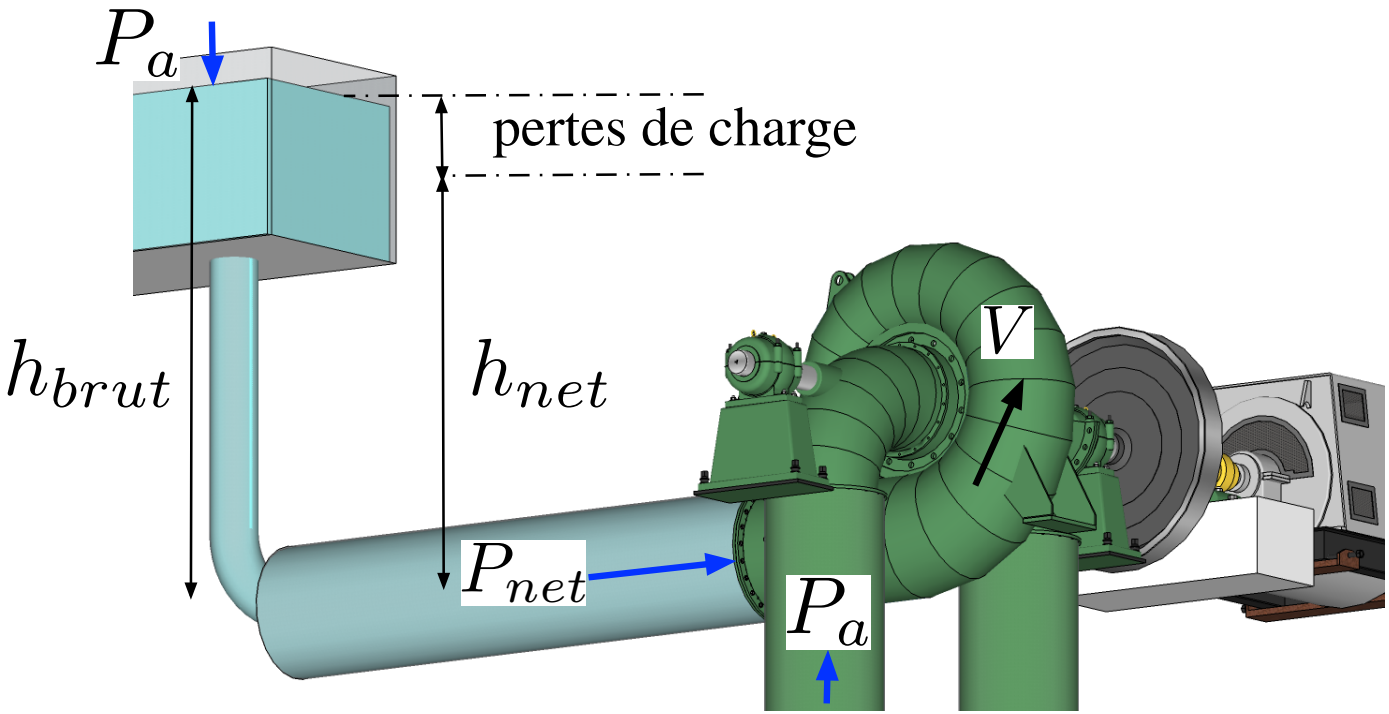
$$\Pi_{theo} = \frac{dW}{dt} = \rho\,g\,h_{brut}\,A\,V = \rho\,g\,h_{brut}\,Q$$

Rendement d'une centrale

$$\Pi_{rec} = \eta \, \rho \, g \, h_{brut} \, Q$$

$$\Pi_{rec}(\mathrm{kW}) = 8 \, h_{brut}(\mathrm{m}) \, Q(\mathrm{m^3.s^{-1}})$$

$$\eta \sim 0,8$$



$$h_{net} = \eta \, h_{brut}$$

Basculement d'un barrage

$l = 100$ m

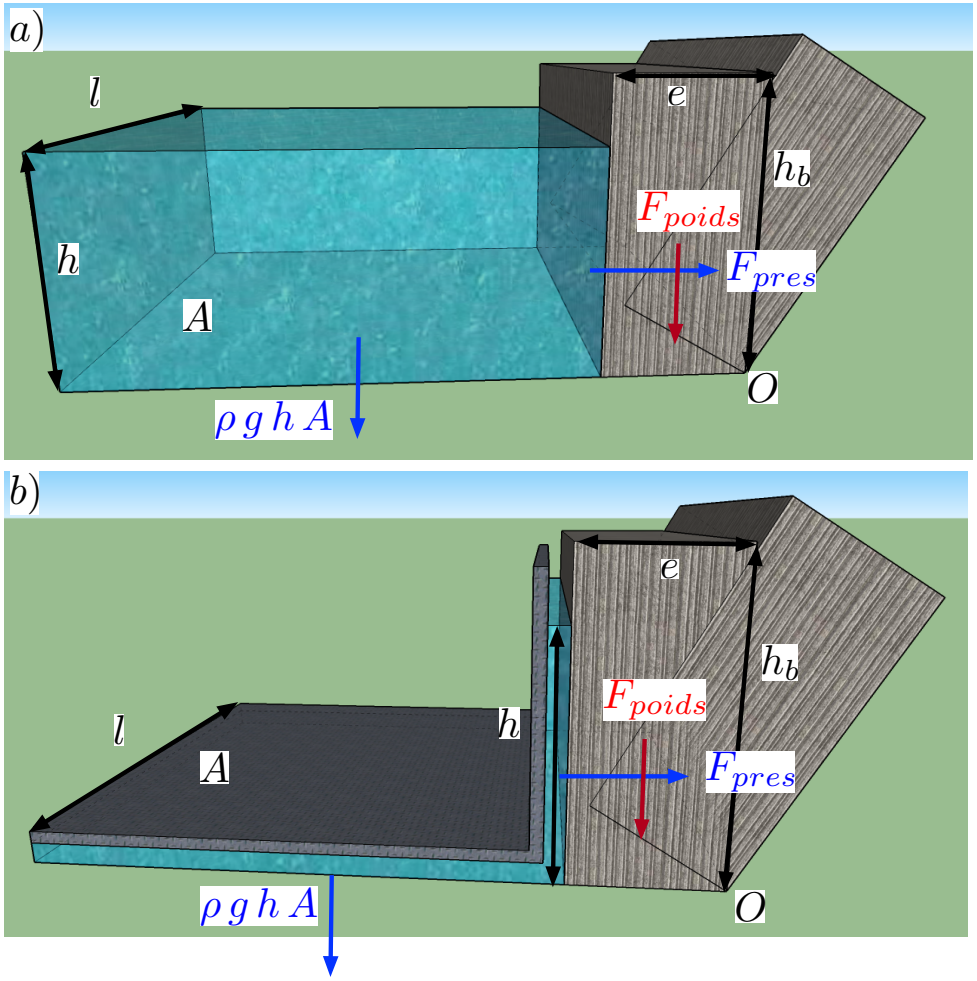
$h = 9$ m

$e = 4$ m

$h_b = 10$ m

Calculer le rapport $\dfrac{\rho_s}{\rho}$

minimum pour éviter le basculement



Triangle des forces de pression