

Ex.3 Vidange d'une cuve - formule de Torricelli

3

Bernoulli entre A et B, $P_0 + \rho g z_n + \frac{\rho v_n^2}{2} = P_0 + \rho \frac{v_A^2}{2}$

$$S v_n = \Delta v_A \quad v_n = \frac{\Delta}{S} v_A \ll v_A$$

$$\Rightarrow v_A = \sqrt{2g z_n}$$

$$\text{or } v_A = \frac{S}{\Delta} v_n \quad \text{et } v_n = - \frac{dz_n}{dt}$$

$$- \frac{S}{\Delta} \frac{dz_n}{dt} = \sqrt{2g z_n}$$

$$\frac{2 dz_n}{2 \sqrt{z_n}} = - \frac{\Delta \sqrt{2g}}{S} dt$$

$$2 \sqrt{z_n} = - \frac{\Delta \sqrt{2g}}{S} t + A$$

$$t=0 \quad z_n=h \quad 2\sqrt{h} = A$$

$$2\sqrt{z_n} = - \frac{\Delta \sqrt{2g}}{S} t + 2\sqrt{h}$$

$$z_n=0 \text{ pr } t=t_0 \quad \frac{\Delta \sqrt{2g}}{S} t_0 = 2\sqrt{h}$$

$$\frac{\Delta \sqrt{g}}{S} t_0 = \sqrt{2h}$$
$$t_0 = \frac{S}{\Delta} \sqrt{\frac{2h}{g}}$$

A.N.

$$t_0 = \frac{10 \times 5}{0,5 \times 10^{-2}} \sqrt{\frac{4}{10}}$$
$$= \cancel{63 \times 10^3} \text{ s} \quad 63 \times 10^3 \text{ s}$$

$$t_0 = 1 \text{ h } 45 \text{ mn}$$