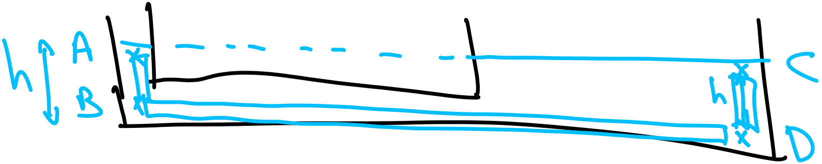
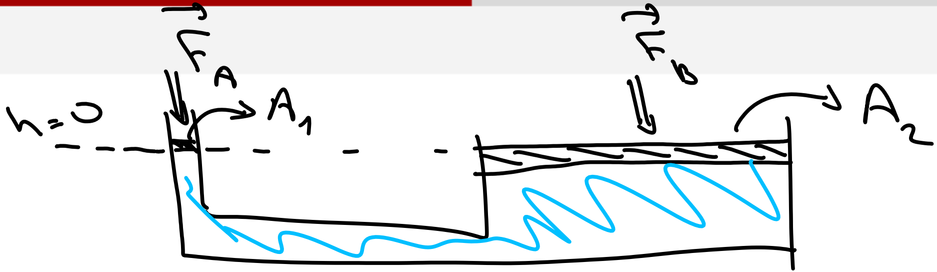
Hydrolics

$$P = P_0 + \rho g h$$

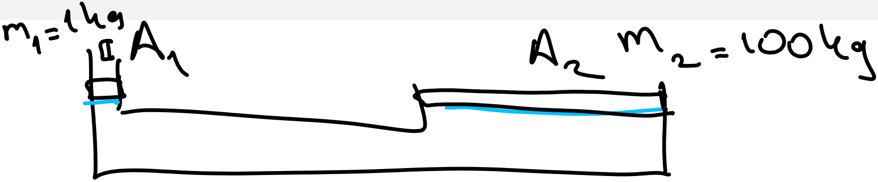


$$P_A - P_B = P_C - P_D$$
$$P_B = P_D$$
$$\Big\} \; P_A = P_C$$



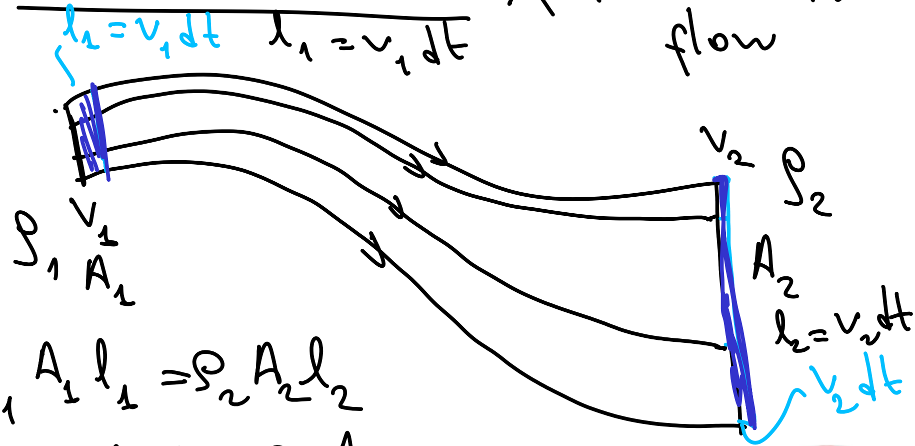
$$P = P_0 + \rho g h_0$$

$$\frac{F_A}{A_1} = \frac{F_B}{A_2} \implies F_A = \frac{A_1}{A_2} F_B$$



$$\frac{A_1}{A_2} = \frac{1}{100}$$

Laminar Flow X Turbulant flow



$$\rho_1 A_1 l_1 = \rho_2 A_2 l_2$$

$$\Rightarrow \rho_1 A_1 v_1 = \rho_2 A_2 v_2$$

$$\rho_1 A_1 v_1 = \rho_2 A_2 v_2$$

if $\rho_1 = \rho_2$ incompressible liquid

$$\Rightarrow \boxed{A_1 v_1 = A_2 v_2}$$

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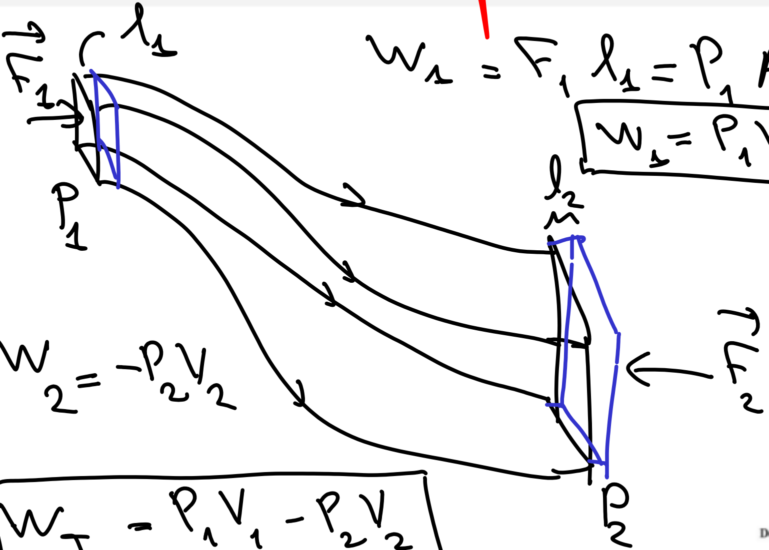
Bernoulli's Principle

$$W_1 = F_1 l_1 = P_1 A_1 l_1$$

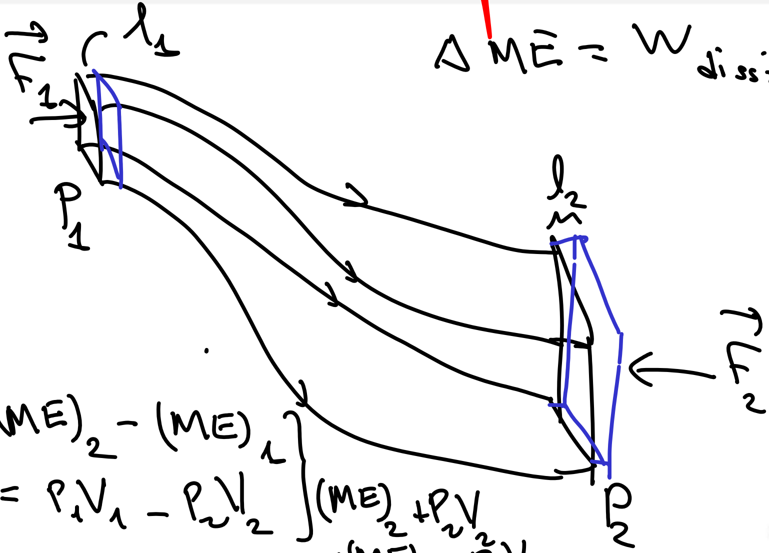
$$\boxed{W_1 = P_1 V_1}$$



$$W_2 = -P_2 V_2$$

$$\boxed{W_T = P_1 V_1 - P_2 V_2}$$

Bernoulli's Principle



$$\Delta ME = W_{dissip} = P_1V_1 - P_2V_2$$

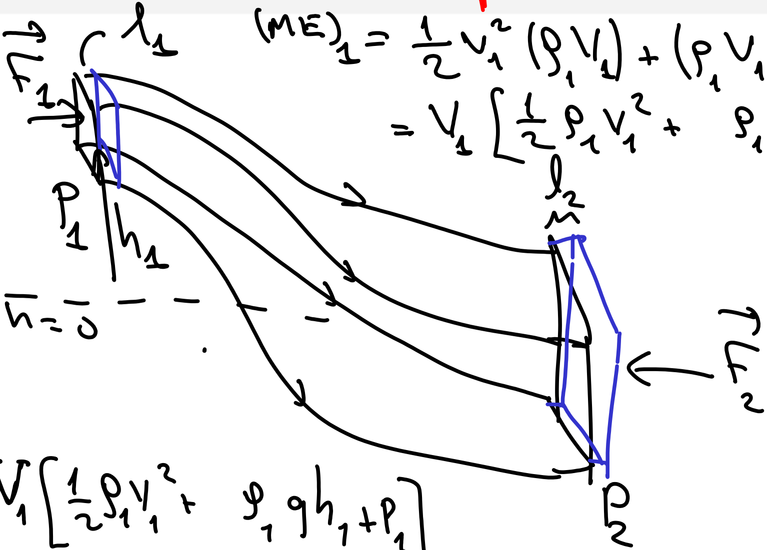
$$(ME)_2 - (ME)_1 = P_1V_1 - P_2V_2$$

$$(ME)_2 + P_2V_2 = (ME)_1 + P_1V_1$$

Bernoulli's Principle

$$(ME)_1 = \frac{1}{2} v_1^2 (\rho_1 V_1) + (\rho_1 V_1) g h_1$$

$$= V_1 \left[\frac{1}{2} \rho_1 v_1^2 + \rho_1 g h_1 \right]$$



$$V_1 \left[\frac{1}{2} \rho_1 v_1^2 + \rho_1 g h_1 + P_1 \right]$$

$$V_1\left[\frac{1}{2}\rho_1 v_1^2 + \rho_1 g h_1 + P_1\right] = (1 \to 2)$$

$+$ incompressibility $\Rightarrow V_1 = V_2$

$$\Rightarrow \boxed{\frac{1}{2}\rho v^2 + \rho g h + P = \text{const}}$$

Bernoulli's eqn

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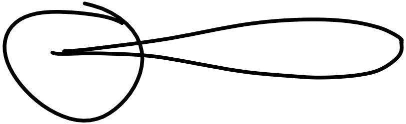
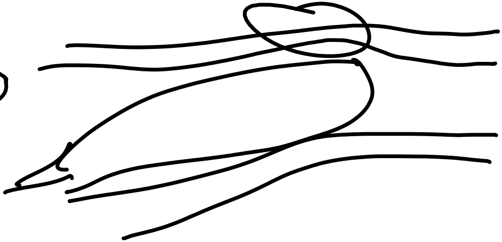
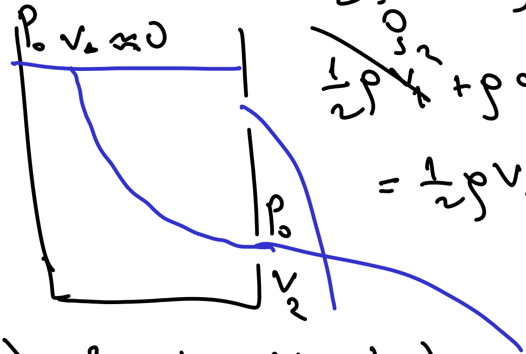




$$A_1 v_1 = A_2 v_2$$

Ex

$$\frac{1}{2}\rho v^2 + \rho g h + P = \text{const}$$

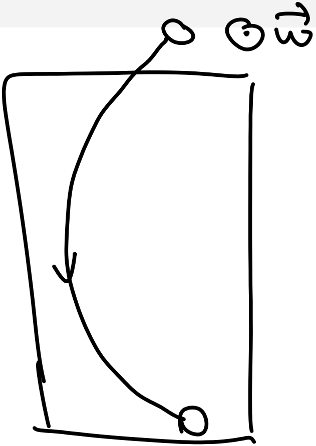


$$\frac{1}{2}\rho v_1^2 + \rho g h_1 + P_0$$

$$= \frac{1}{2}\rho v_2^2 + \rho g h_2 + P_0$$

$$\frac{1}{2}\rho v_2^2 = \rho g (h_1 - h_2)$$

$$v_2 = \sqrt{2 g \Delta h}$$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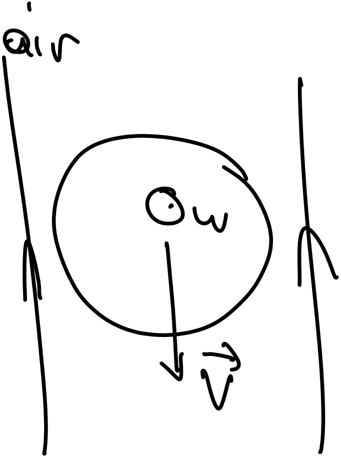
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