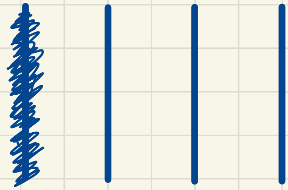
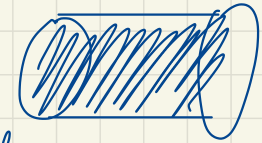
LP27 : production d'énergie électrique décarbonée

$m(x,t)$

$$\delta^2 N_c = K\, m\, d\tau\, dt$$



$\vec{j}$



S

$$d^2 N = m(x, t+dt)\, S\,dx - m(x,t)\, S\,dx$$

$$\boxed{d^2 N = \frac{\partial m}{\partial t}\, S\,dx\,dt}$$

$$\delta^2 N_e = -\frac{\partial j_x}{\partial x}\, S\,dx\,dt$$

$$\boxed{= D\frac{\partial^2 m}{\partial x^2}\, S\,dx\,dt}$$

$$d^2 N = \delta^2 N_c + \delta N_e$$

$$\frac{\partial m}{\partial t}\, S\,dx\,dt = D\frac{\partial^2 m}{\partial x^2}\, S\,dx\,dt + K\,m\, S\,dx\,dt$$

$$\boxed{\frac{\partial m}{\partial t} = D\frac{\partial^2 m}{\partial x^2} + K m}$$

Statio : $\dfrac{\partial^2 m_S}{\partial x^2} + \dfrac{1}{\delta^2} m_S = 0$, $\delta = \sqrt{D/K}$

$m_S(x) = A \sin(x/\delta) + B\cos(x/\delta)$

$$\boxed{m_S(x) = A \sin\left(\pi \frac{x}{L}\right)}$$

$\bar{m}_S = \dfrac{2A}{\pi}$. $m(x,t) = m_S(x)\, f(t)$

$f(t) = A \exp\left(\left(\dfrac{\pi^2 D}{L^2} - K\right) t\right)$ ⇝ pas de RS

$$\boxed{D = D_S\left(1 + \alpha\left(\bar{m}(t) - \bar{m}_S\right)\right)} \quad (*)$$

$D = \ell^* v^*$. $\alpha > 0$

⇝ $\dfrac{df}{dt} + K \alpha \bar{m}_S f(t)\left(f(t) - 1\right) = 0$

⇝ $S_1(t) = 1$ ou $S_2(t) = 0$ RS

(*) $\boxed{D = D_s\left(1+\alpha\cdot\left(\bar m(t) - \bar m_s\right)\right)}$, $\bar m(t) = \bar m_s(x)\,\rho(t)$

$= D_s + \alpha \bar m_s(\rho(t)-1)$

$$\frac{\partial m}{\partial t} = D\frac{\partial^2 m}{\partial x^2} + Km$$

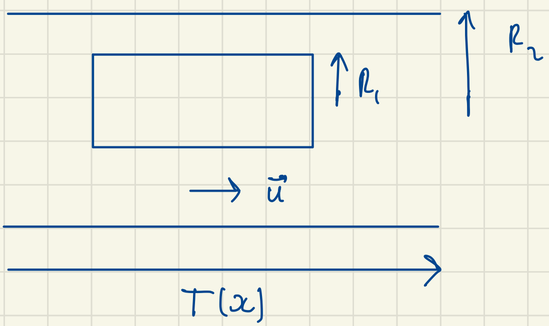
$$m(x)\,\dot\rho(t) = D_s\left(1+\alpha\bar m_s(\rho(t)-1)\right)\frac{\partial^2 \bar m_s}{\partial x^2}\rho(t) + K m_s\rho(t)$$

$$\boxed{\dot\rho + K\alpha\,\bar m_s\,\rho(t)\,(\rho(t)-1) = 0}$$

Deux régimes stationnaires $\rho = 0$ ou $\rho = 1$

instable stable

Écoulement d'eau autour du barreau :



rôle double de l'eau :

joue le rôle de modérateur

la diminue D. mais récupère

aussi la chaleur.

$$\boxed{d^2U = \mu_e\pi(R_2 - R_1)c_e u\frac{dT}{dx}\,dx\,dt}$$

$$\delta^2 Q = (2\pi R_1 dx)\, h (T_c - T(x))\, dt$$

$$d^2U = \delta^2 Q \qquad 1^{er} \text{ ppe}$$

$$\delta \frac{dT}{dx} + T = T_c$$

$$\boxed{\eta_J = 1 - \sqrt{\frac{T_c}{T_J}}}$$

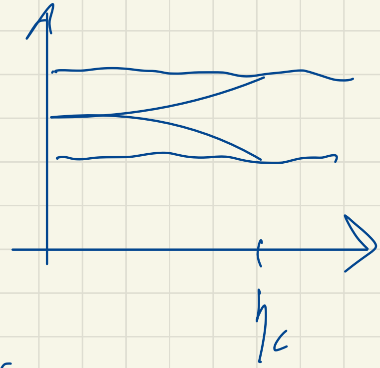
$$P_c = G_c (T_c - T_1)$$

$$T(x) = T_c + (T_1 - T_c)\exp(-x/\delta)$$

$$G_c = 2\pi R_1 h \delta \left[1 - \exp(-L/\delta)\right] \sim 2\pi R_1 h L$$

$$\frac{T_2}{T_1} = 1 - \eta \qquad \frac{P_F}{P_c} = \eta - 1$$

$$\eta - 1 = \frac{P_F}{P_c} = \frac{G_F (T_F - T_2)}{G_c (T_c - T_1)}$$



$$P = -\eta P_c$$

choix de η via T_1 : on effectue ce cycle plus vite

$$|P| = \frac{\eta G_C G_F \left((1-\eta)T_C - T_F\right)}{(1-\eta)G_C + G_F}$$

$$\frac{d|P|}{d\eta} = 0 \Leftrightarrow \eta = \eta_F = 1 - \sqrt{\frac{T_F}{T_C}}$$