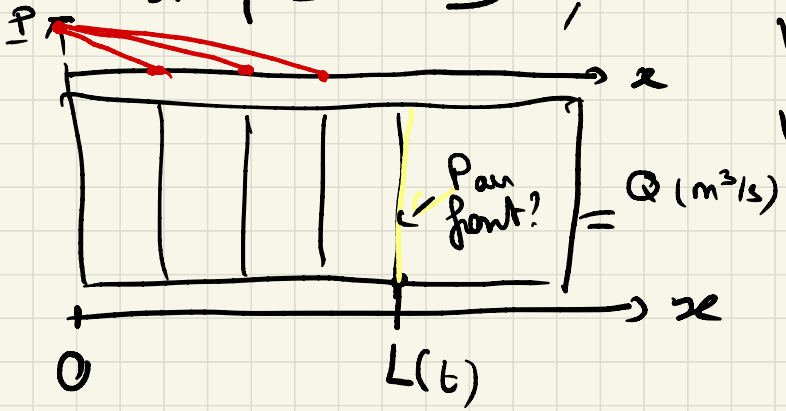
MSE 340 Notes

Cas simple 1D, saturé $S = 1$



$V_p = 0$

$V_l + V_f = 1$

$V_l = 1 - V_f$

Rigide: V_f = constant.

Isotherme T = constant uniforme.

Cons. masse : $\frac{\partial V_l}{\partial t} + \nabla(V_l \vec{v}_l) = 0$

$$\frac{d}{dx}(\vec{v}_l) = 0$$

Darcy : $\|\vec{v}_0\| = \frac{Q}{A} = -\frac{K}{\eta} \nabla P$ néglige $\vec{g}$

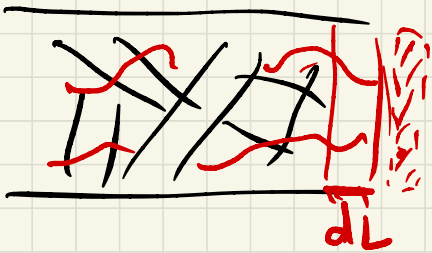
$$\vec{v}_0 = -\frac{K}{\eta} \frac{dP}{dx}$$

Cons. énergie : isotherme, pas réaction → Pas besoin

Eq Mécanique : Rigide, intervient Pas.

. $v_0 = \frac{Q}{A}$ vitesse superficielle de filtration

. v_l : vitesse du liquide $\frac{dL}{dt}$

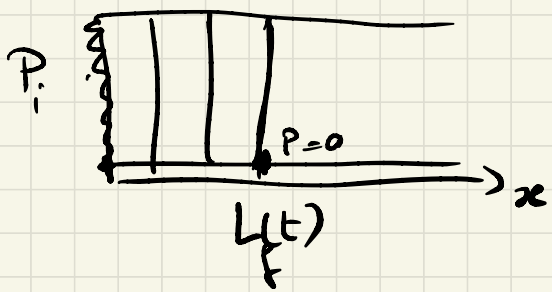


$Q_{dt} = A\, dL\, (1 - V_s)$

$\frac{Q}{A} = (1 - V_s)\frac{dL}{dt}$.

$L = 20\,m$ $V_f = 0.5$, epoxy $\eta \simeq 0.1\ Pa.s$

$K = 10^{-12}\ m^2$



$P_{imp} = cste$

$\Delta P_\gamma \simeq 0$

$$\frac{d}{dx}(v_e) = 0 \qquad (1)$$

$$v_0 = (1-V_f)\, v_e = (1-V_f)\frac{dL}{dt} = -\frac{K}{\eta}\frac{dP}{dx} \qquad (2)$$

(2) dans (1) $\frac{d}{dx}\left(\frac{dP}{dx}\right) = 0 \rightarrow \frac{d^2P}{dx^2} = 0$

$$\frac{dP}{dx} = cste = \frac{\Delta P}{L} < 0$$

dans (2) $(1-V_f)\frac{dL}{dt} = -\frac{K}{\eta}\frac{\Delta P}{L(t)}$

$$\int_0^{L_f} L(t)\,dL = \int_0^{t_{inj}} -\frac{K}{\eta(1-V_f)}\Delta P\,dt$$

$$\frac{1}{2}L_f^2 = -\frac{K\,\Delta P}{\eta(1-V_f)}t_{inj} \rightarrow t_{inj} = \frac{1}{2}\frac{L_f^2\,\eta(1-V_f)}{K(\Delta P)}$$

$L = 20\,m$

$$t_{inj} = \frac{1}{2} \frac{L_s^2 (1 - V_f)\,\eta}{K(\Delta P)}$$

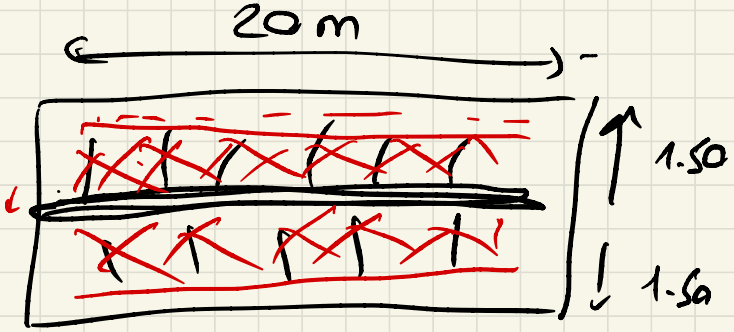
$$= \frac{1}{2} \frac{(20)^2 \cdot 0.5 \cdot 0.1}{10^{-12}\ 5.10^5} = \frac{1}{2} 20^2 . 10^5\ s.$$

$$= \frac{1}{2} 400 . 10^5$$

$$= 2 . 10^7\ s.$$

$= t_{très\ grad.}$

Fait infusions



ep 3mm