9/28/23

Example:

q	ΔP
0	0
0.0014	0.0476
⋮	⋮
0.3111	10.465

$\mu = 105.363\ cp$

$L = 115.6\ cm$

$D = 4.961\ cm$

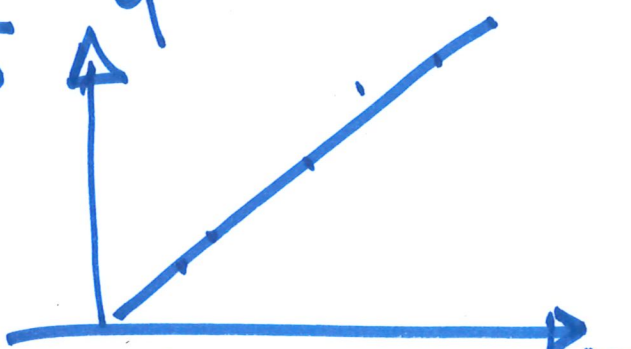
$\phi = 37.8\ \%$

$$K = \frac{q\mu\,\Delta L}{A|\Delta P|} = \frac{q}{\Delta P}\,\frac{(115.6)(105.36)}{\frac{\pi}{4}(4.961)^2}$$

$$\rightsquigarrow K = 630.1\,\frac{q}{\Delta P}$$

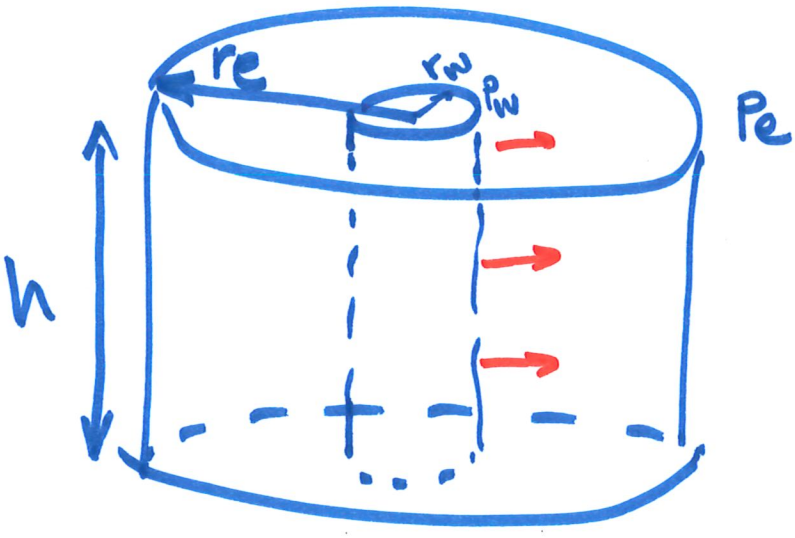
$$\frac{q}{\Delta P} = \frac{1}{33.658}$$

$$\Rightarrow \boxed{K \simeq 18.7\ D}$$



(1)

Example :



$$q = -\frac{k}{\mu} A \frac{dP}{dr}$$

$$= \frac{-k}{\mu} 2\pi r h \frac{dP}{dr}$$

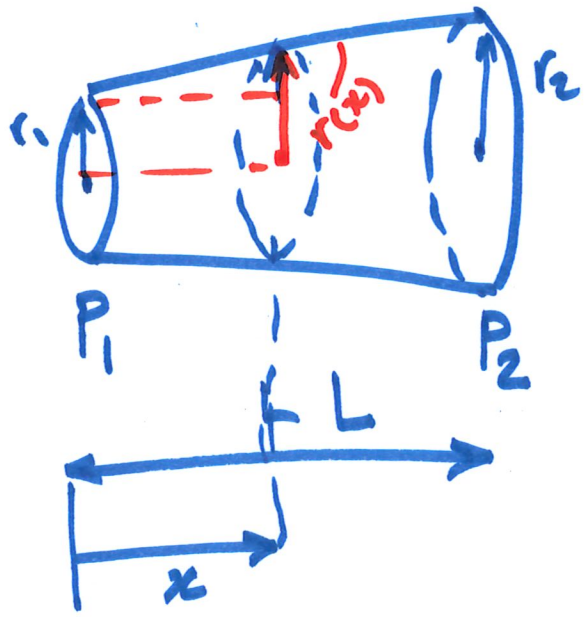
$$\rightarrow q \int_{r_w}^{r_e} \frac{dr}{r} = \frac{-k}{\mu} 2\pi h \int_{P_w}^{P_e} dP$$

$$\rightarrow q \ln\left(\frac{r_e}{r_w}\right) = -\frac{k}{\mu} 2\pi h (P_e - P_w)$$

$B =$ res. vol. / ST vol.

$$q_{res} = q_{ST} B$$

Example :



$\Delta P = P_1 - P_2$

q, r_1, r_2

L, μ, k

$$q = -\frac{k}{\mu} A \frac{dP}{dx}$$

$$A(x) = \pi r(x)^2$$

$$r(x) = r_1 + \frac{r_2 - r_1}{L} x$$

$$A(x) = \pi [r(x)]^2$$

$$= \pi \left[r_1 + \frac{r_2 - r_1}{L} x \right]^2$$

$$q = -\frac{K}{\mu} \pi \left[r_1 + \left(\frac{r_2 - r_1}{L} x \right)^{\alpha} \right]^2 \frac{dP}{dx}$$

$$q = -\frac{\pi K (r_1 + \alpha x)^2 \, dP}{\mu \, dx}$$

$$-\int_{P_1}^{P_2} dP = \int_0^L \frac{q \mu dx}{\pi K (r_1 + \alpha x)^2}$$

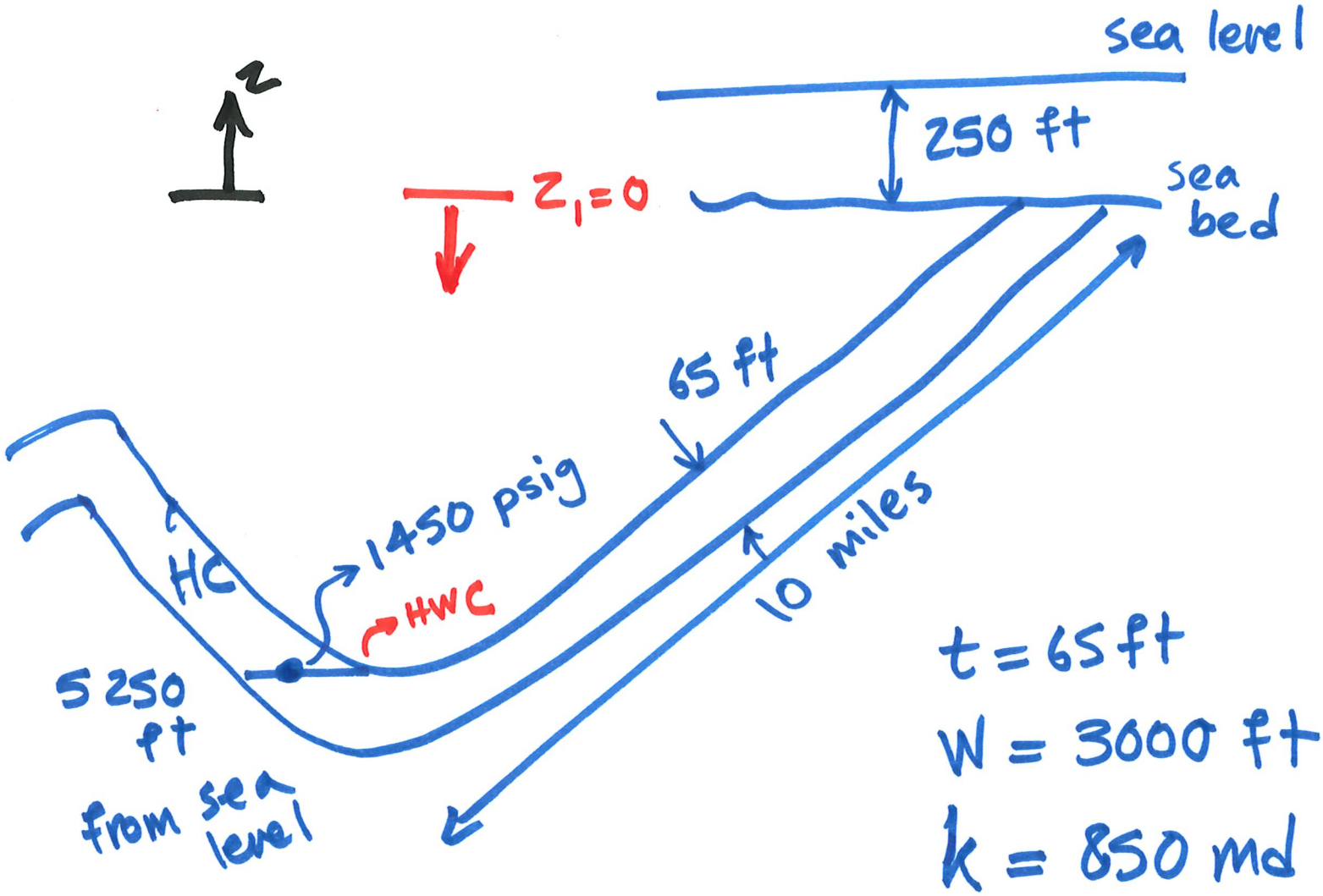
$$-(P_2 - P_1) = \frac{q\mu}{\pi K} \int_0^L \frac{dx}{(r_1 + \alpha x)^2}$$

$$= -\frac{q\mu}{\pi K} \left[\frac{1}{(r_1 + \alpha x)\alpha} \right]_0^L$$

$$\Delta P = \frac{q \mu L}{\pi k r_1 r_2}$$

$v_s \rightarrow$ Darcy velocity

$$v_s = \frac{q}{A} = -K \frac{dh}{ds}$$



$t = 65$ ft

$W = 3000$ ft

$k = 850$ md

q (bbl/day) = ?

$\gamma_w = 1.038$

$\mu = 1$ cp

$B = 1$ RB/STB

$$q = -0.001127 \frac{kA}{\mu B}\left[\frac{dP}{ds} - 0.433\gamma\frac{dz}{ds}\right]$$

$$A = (65)(3000) = 195000\ ft^2$$

$$k = 850\ md$$

$$\mu = 1\ cp$$

$$B = 1\ RB/STB$$

$$\Delta S = 10\ miles = 10(5280) = 52800\ ft$$

$$\Delta z = 5000\ ft$$

$$\Delta p = 1450 - P_1 = 1450 - 112.36 = 1337.64\ psi$$

$$P_1 = 0.433\,\gamma h = 0.433\,(1.038)(250)$$

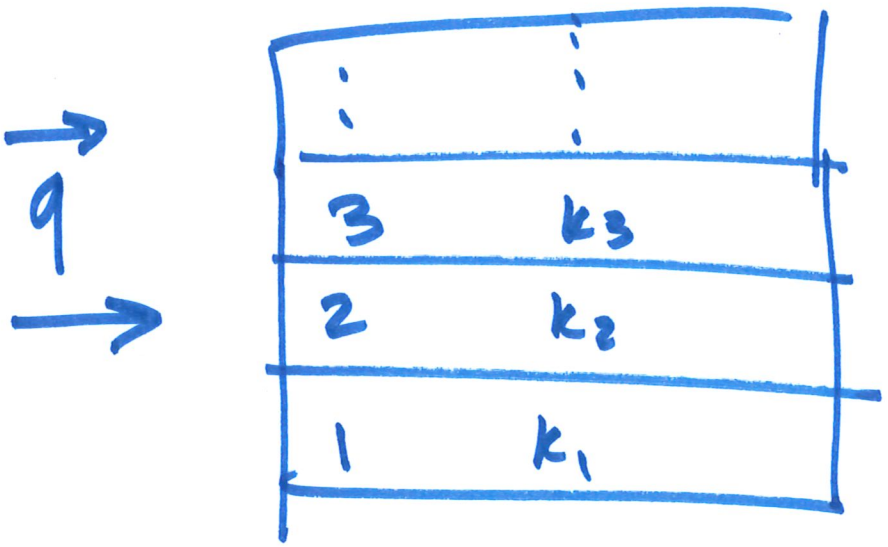
$$\rightarrow P_1 = 112.36\ psig$$

$$q = -0.001127 \frac{(850)(195000)}{(1)}$$

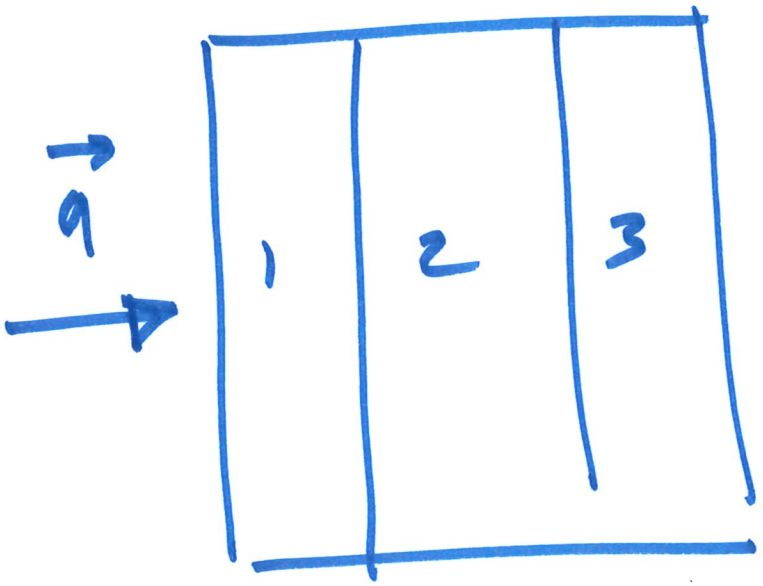
$$\times \left[\frac{1337.64}{52800} - 0.433(1.038) \frac{5000-0}{52800} \right]$$

B/day

$$\Rightarrow \boxed{q = 3218.2 \text{ B/day}}$$



$K_{avg} = ?$



. . . $K_{avg} = ?$