$$q_o = \frac{2\pi k h (p_e - p_{wf})}{(\mu_o B_o)_{@p_{av}} \left[\ln\left(\frac{r_e}{r_w}\right) - 0.5\right]}$$

- steady-state
- vertical well, fully perforated
- undersaturated oil
- radial drainage volume
- homogeneous permeability

SI system

$$\left[\frac{Sm^3}{s}\right] = \frac{[m^2][m][Pa]}{[Pa\,s][-]}$$

$$\left[\frac{Sm^3}{d}\ \frac{1d}{24h}\ \frac{1h}{3600s}\right] = \frac{\left[1\,md\ \frac{1d}{1000\,md}\ \frac{9.86E\text{-}13\ m^2}{1d}\right][m]\left[bara\ \frac{10^5\,Pa}{1\,bara}\right] \cdot \pi}{\left[1\,cp\ \frac{10^{-3}\,Pa.s}{1cp}\right]}$$

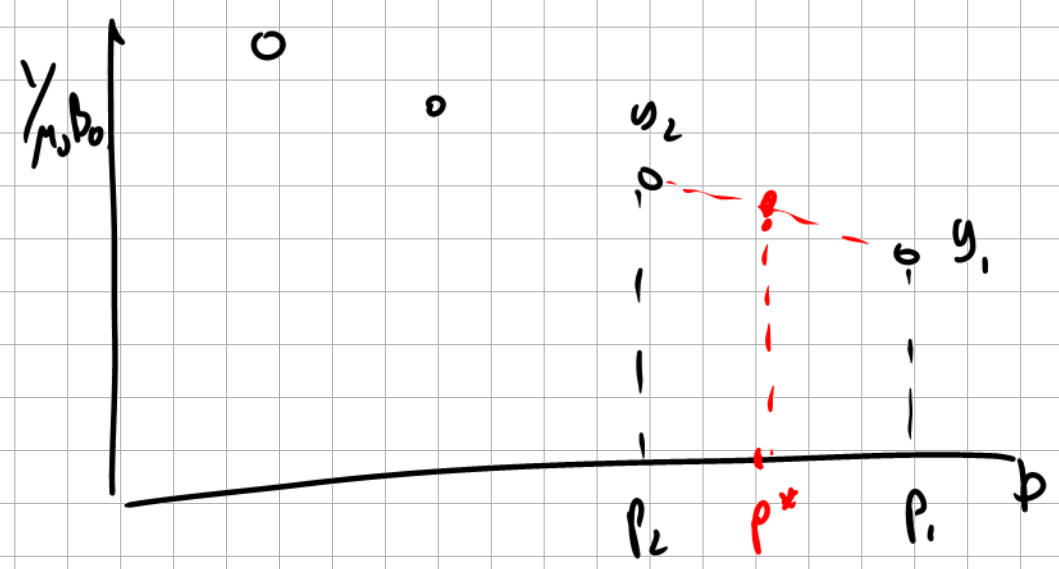
$$= \frac{1}{18.68}$$

$$q_o = \frac{kh}{(\mu_o B_o)_{@p_{av}}} \frac{(p_e - p_{wf})}{\left(\ln\frac{r_e}{r_w} - 0.5\right)} \frac{1}{18.68}$$

J

p in bara
k in md
μ_o in cp
$q_o = Sm^3/d$

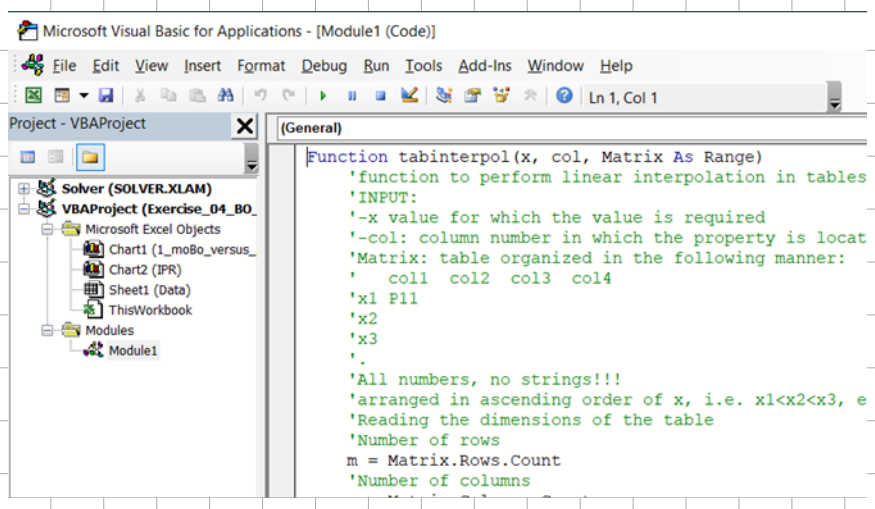
$$J = \frac{kh}{(\mu_o B_o)_{av}\left(\ln\left(\frac{r_e}{r_w}\right) - 0.5\right) \cdot 18.68}$$



$$\frac{y_2 - y_1}{p_2 - p_1} = \frac{y_2 - y^?}{p_2 - p^*} \qquad y = \frac{1}{\mu_o B_o}$$

VBA visual basic for application

whole in excel press alt + F11

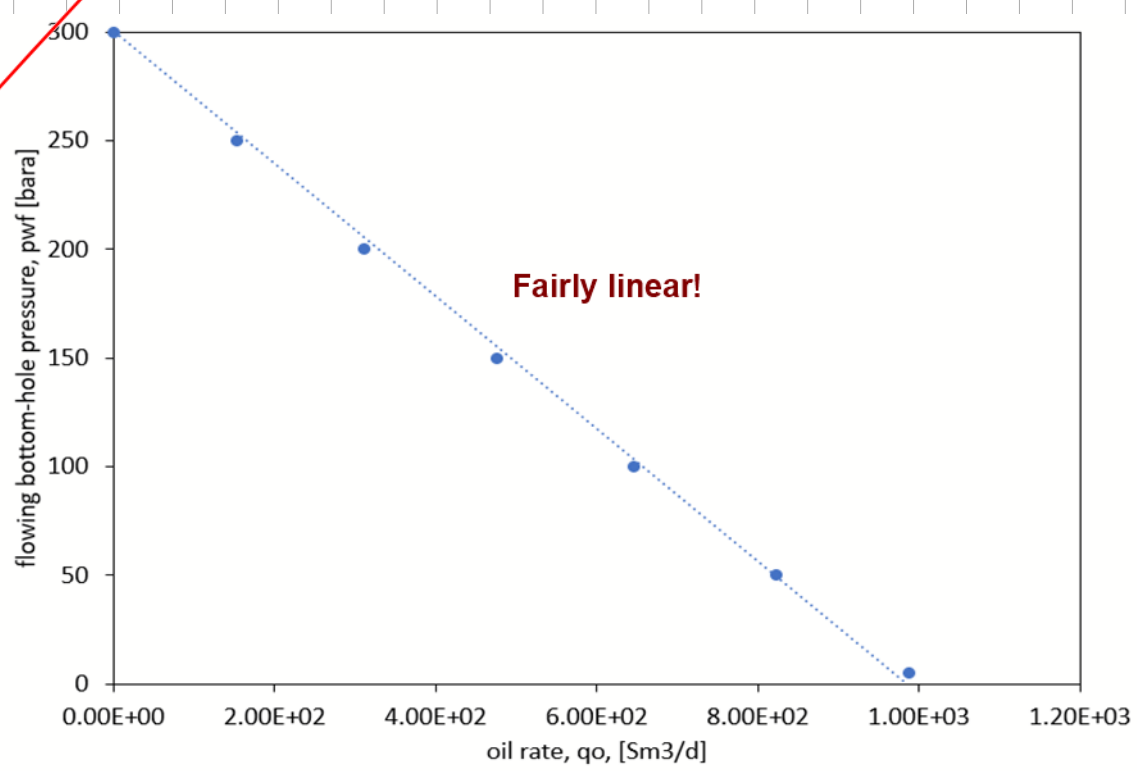


Use here the VBA function ProductivityIndex_J

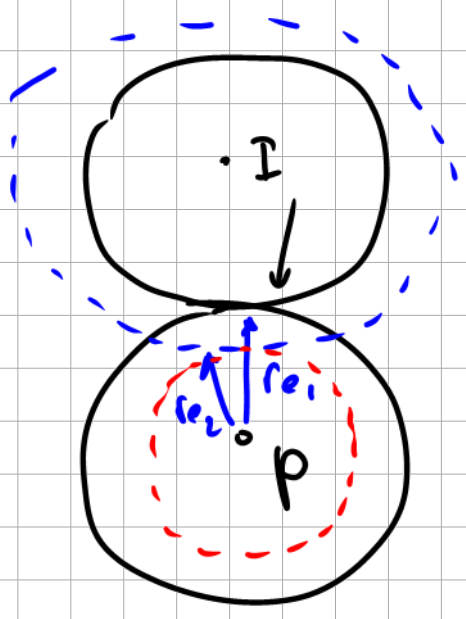
r_e	[m]	500
r_w	[m]	0.1
k	[md]	10
h	[m]	100
p_R	[bara]	300

use here the VBA function tabinterpol

pwf [bara]	pav [bara]	1/(Bo visco) [1/(cp*m3/Sm3)]	J [Sm3/d/bar]	qo [Sm3/d]
300	300	0.449	3.0	0.00E+00
250	275	0.457	3.1	1.53E+02
200	250	0.465	3.1	3.11E+02
150	225	0.474	3.2	4.75E+02
100	200	0.483	3.2	6.46E+02
50	175	0.493	3.3	8.23E+02
5	153	0.502	3.3	9.88E+02



EFFECT OF THE BOUNDARY (re)



EFFECT OF THE REGIME (SS)

r_e	[m]	500
r_w	[m]	0.1
k	[md]	10
h	[m]	100
p_R	[bara]	300

$\ln\left(\frac{r_e}{r_w}\right) =$ 8.52E+00

$$J = \frac{kh}{18.68\,(\mu_o B_o)_{av}\left(\ln\frac{r_e}{r_w} - 0.5\right)}$$

8.5 — 10%

SS, boundary effect

r_e	[m]	500
r_w	[m]	0.1
k	[md]	10
h	[m]	100
p_R	[bara]	300

pwf [bara]	pav [bara]	1/(Bo visco) [1/(cp*m3/Sm3)]	J [Sm3/d/bar]	qo [Sm3/d]
300	300	0.449	3.0	0.00E+00
250	275	0.457	3.1	1.53E+02
200	250	0.465	3.1	3.11E+02
150	225	0.474	3.2	4.75E+02
100	200	0.483	3.2	6.46E+02
50	175	0.493	3.3	8.23E+02
5	153	0.502	3.3	9.88E+02

r_e	[m]	400
r_w	[m]	0.1
k	[md]	10
h	[m]	100
p_R	[bara]	300

pwf [bara]	pav [bara]	1/(Bo visco) [1/(cp*m3/Sm3)]	J [Sm3/d/bar]	qo [Sm3/d]
300	300	0.449	3.1	0.00E+00
250	275	0.457	3.1	1.57E+02
200	250	0.465	3.2	3.20E+02
150	225	0.474	3.3	4.89E+02
100	200	0.483	3.3	6.64E+02
50	175	0.493	3.4	8.46E+02
5	153	0.502	3.4	1.02E+03