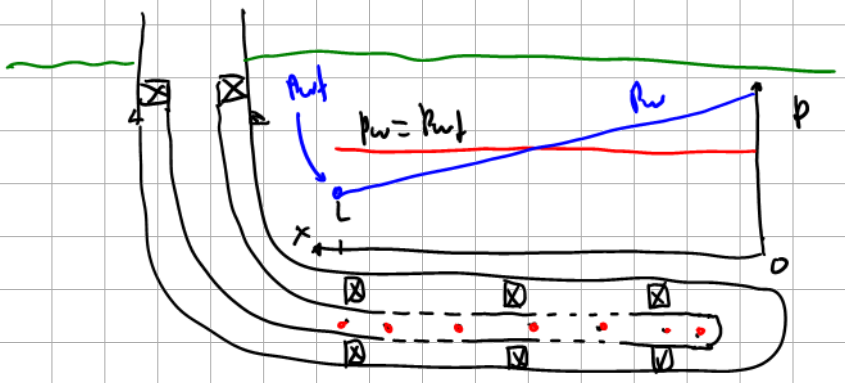
Video 13.1 - Effect of wellbore pressure drop on horizontal undersaturated oil well IPR

Prof. Milan Stanko (NTNU)



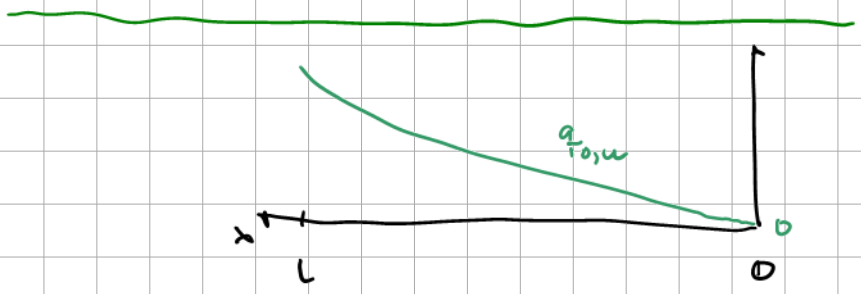
$$q_o = J\,(p_e - p_{wf})$$

$$\frac{dp_w}{dx} = -\rho_o \frac{f}{\phi}\frac{v^2}{2}$$

$$v = \frac{q_{o,w}(x)}{A} \qquad q_{o,w} \cdot B_{o,w} = q_{o,w}$$

$$A = \frac{\pi \phi^2}{4}$$

$$\frac{dp_w}{dx} = -\rho_o \frac{f}{\phi^5}\frac{8\, q_{o,w}^2 \cdot B_{o,w}^2}{\pi^2}$$



Pressure Drop in Horizontal Wells and Its Effect on Production Performance

Ben J. Dikken, SPE, Koninklijke/Shell E&P Laboratorium

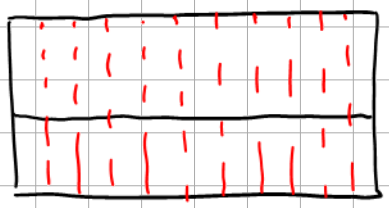
(1989)

Author

Ben J. Dikken is a reservoir engineer in the Technology Development Dept. of Shell Intl. Petroleum Mij. B.V. in The Hague, with interests in horizontal wells, propagating waterflood-induced fractures, and well testing. He previously worked at the Koninklijke/Shell E&P Laboratory in Rijswijk. He holds MS and PhD degrees in physics, both from the State U. of Utrecht, The Netherlands.

mass conservation in wellbore

$$\frac{d\,q_{o,w}}{dx} = q_{o,i}$$



$$q_o = J\,(p_e - p_{wf})$$

$$q_{o,i} = j\,(p_e - p_w)$$

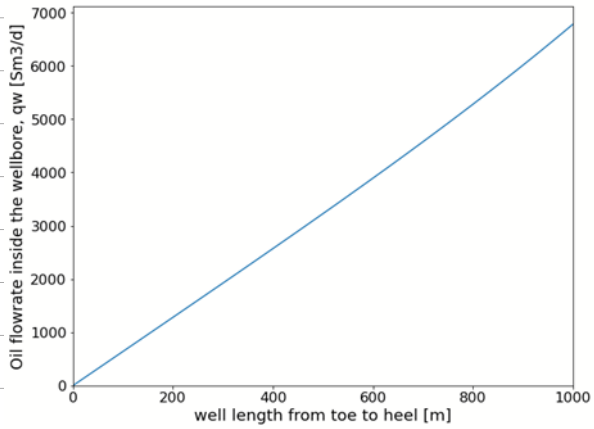
$$j = J/L = \left[\frac{Sm^3/d/bar}{m}\right]$$

$$\left.\begin{aligned} \frac{d\,q_{o,w}}{dx} &= j\,(p_e - p_w) \\ \frac{dp_w}{dx} &= -\rho_o \frac{f}{\phi^5}\frac{8\, q_{o,w}^2 \cdot B_{o,w}^2}{\pi^2} \end{aligned}\right\} \quad \text{at } x^* = 0$$

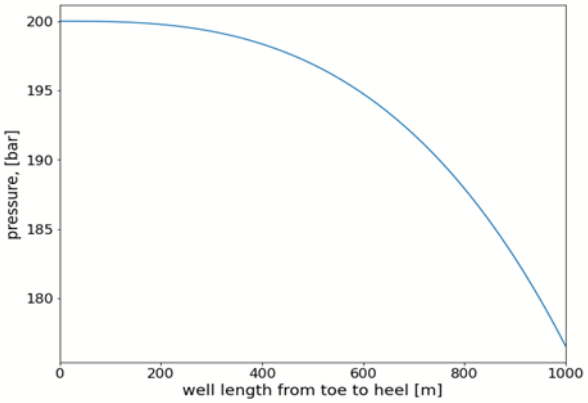
p_w = assumed value $< p_e$

$q_{o,w} = 0$

Solution (using Python)



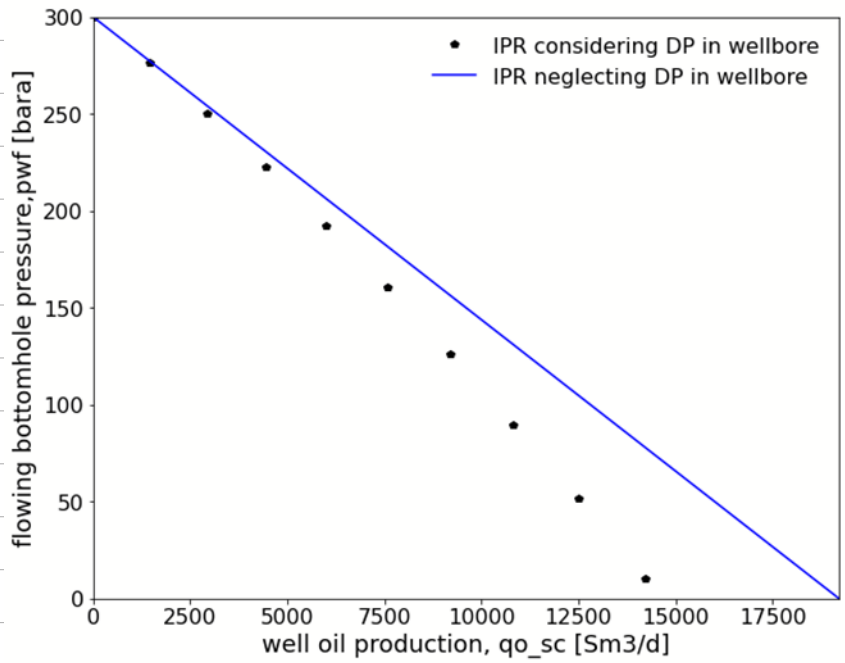
Uniform oil influx along the wellbore



Non-linear distribution of wellbore pressure

How to obtain the IPR of the well?

repeat using other values of pw@toe



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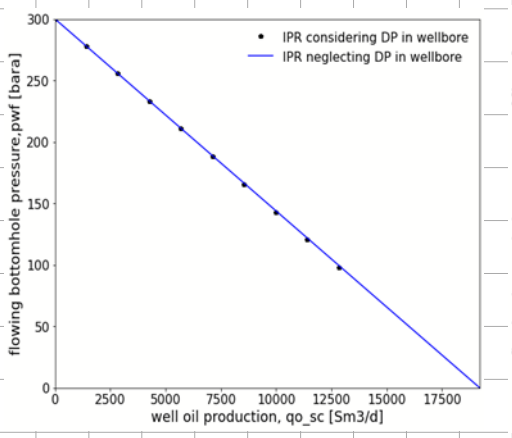
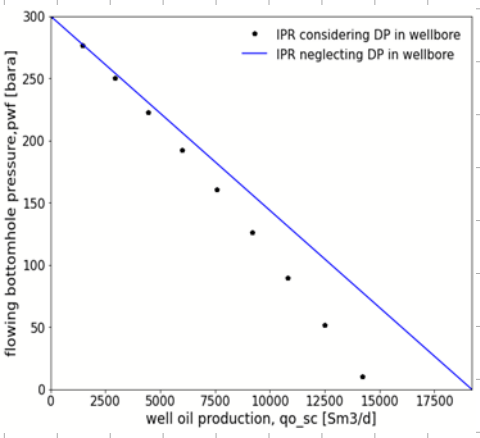
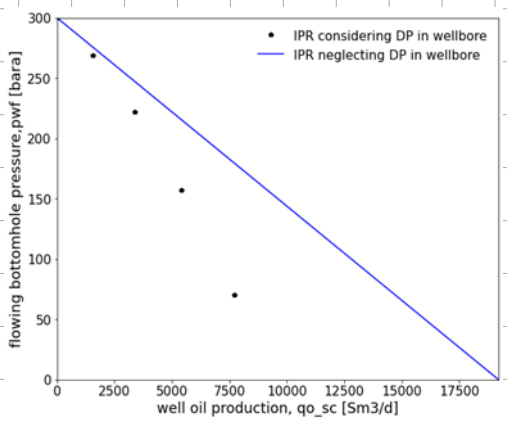
Effect of liner diameter



0.2 m



0.1 m



0.07 m