Problem 3

- a cubic block of a carbonate rock

↳ matrix porosity = 19%

permeability of matrix = 1 mD

width of fracture = 2.5×10^{-3} in

μ of flowing fluid = 1.5 cP

ΔP = 10 psia

a) calculate the k of fracture if each square foot contains one fracture in the direction of fluid flow.

$$k = 5.2476 \times 10^{10} \times (2.5 \times 10^{-3})^2 = 34.05 \times 10^{4} \text{ mD}$$

$$= 340.5 \text{ D}$$

b) How long will the field last through the fracture and fracture matrix system.

$$A = 2.08 \times 10^{-4} \text{ ft}$$

$$q = 1.127 \times 10^{-3} \frac{kA\Delta P}{\mu L} = (1.127 \times 10^{-3}) \frac{(340.5 \times 10^{3})(2.08 \times 10^{-4})(10)}{1.5 \times 1}$$

$$q_{fracture} = 0.533 \frac{bbl}{Day}$$

$$q = 1.127 \times 10^{-3} \frac{kA\Delta P}{\mu L}$$

$$= (1.127 \times 10^{-3}) \frac{(1)(1)(10)}{(1.5)(1)}$$

$$= 0.0075 \frac{bbl}{Day}$$

$$A = 1 - 2.08 \times 10^{-4} \text{ ft} \approx 1 \text{ ft}$$

$$q_T = q_{fracture} + q_{matrix}$$

$$= 0.533 + 0.0075$$

$$= 0.541 \frac{bbl}{Day}$$

FLUID SATURATION

Interstitial water = minimum water that always exist in the formation no matter whether the rock is in gas zone or oil zone.

- when bringing up the core sample, pressure ↓, the oil molecules expands / gas expands, this gas brings water and oil together, } water based mud

thus there will be loss of water and oil when it is brought to the surface.

- however, when we use oil based mud, there is no extra water, there is only interstitial water which cannot be brought by the gas molecules. } Pure gas Lab

Thus there is no water loss when it is brought to the surface.

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