CERE
Center for Energy Resources Engineering

CERE – SEMINAR

Thursday 19 August 2019
09:15 to 10:00 a.m.
B229/003
Breakfast from 09:00

"Permeability modeling of the Lower Cretaceous marly chalks in the Danish North Sea"

By

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Abstract

This study outlines a approach for relating permeability and capillary pressure to specific surface and porosity in the clay rich chalk of the Lower Cretaceous in the Danish North Sea.

The low-permeability marly chalk reservoirs Sola and Tuxen found in the Danish North Sea are challenging to interpret in conventional ways. The varying clay content either situated as separating layers or mixed within the chalk affects the reservoir properties in terms of permeability and capillary forces. In this study we use existing porosity, Klinkenberg permeability and mercury injection capillary data to show how we can consistently model the permeability and capillary pressure from porosity and specific surface.

Permeability was modeled from specific surface and porosity using Kozeny`s equation (1) for laminar flow in a porous medium:

$$k = c\frac{\phi^3}{(S_g \rho_g (1-\phi))^2} \qquad (1)$$

where k is the liquid (here approximated according to Klinkenberg) permeability, ϕ is porosity, ρ_g the grain density and S_g the specific surface of the grains with respect to grain mass, and c is Kozeny`s constant as estimated from porosity by the model of Mortensen et al. (1998).

Capillary pressure was modeled from porosity and specific surface using the Laplace equation (2) by expressing the capillary radius as a function of porosity, specific surface, and grain density:

$$p_c = \frac{2\gamma\cos\theta}{r_c} \Rightarrow P_c = \frac{S_g \rho_g (1-\phi)}{\phi}\gamma\cos\theta \qquad (2)$$

Where p_c is the capillary pressure, γ the interfacial tension, r_c the capillary radius, and θ the wetting angle between the liquid and the surface of the capillary.