

COMPARISON OF SATURATION EXPONENT DATA BY THE 'POROUS PLATE' AND BY THE 'CONTINUOUS INJECTION' TECHNIQUE WITH IN-SITU SATURATION MONITORING

Russell Gray & Ben Trewin, Core Laboratories Advanced Technology Centre, Aberdeen.

Nadia Pallatt & Phil Mitchell, BP Research Centre, Sunbury-on-Thames.

ABSTRACT

Saturation exponents (n) of reservoir rocks, determined from electrical measurements on core samples enable the evaluation of the water saturation of hydrocarbon reservoirs. Errors in this parameter, as derived from the traditional 'porous plate' method have given rise to serious errors in the estimation of hydrocarbon saturation. The major sources of uncertainty have been measurement procedures, core handling and pore geometry.

These data have traditionally been obtained by using gas (non-wetting phase) to displace brine (wetting phase) from a 100 % water saturated core sample. This laboratory procedure mimics the drainage process by which the hydrocarbons entered the reservoir and displaced water. Using gas as a desaturation medium precludes the possibility of the displacing phase wetting the rock surface, thus maintaining a continuous water wetting film during desaturation. Oil displacing brine has not been used frequently because oil wetting may occur during brine displacement. A new approach of continuous oil injection is compared here with the industry standard 'porous plate' technique. During oil injection, X-Ray in-situ saturation monitoring has been used to define the saturation profile along the sample length as the test progresses.