Geophysical Research Abstracts, Vol. 7, 02109, 2005
SRef-ID: 1607-7962/gra/EGU05-A-02109

1 Correlation between microstructure and flow behaviour in porous sandstones

S. Baraka-Lokmane (1,2), I.G. Main (1), B.T. Ngwenya (1), S.C. Elphick (1), C. Jones (2,3), S.A. Hamilton (2), J.M. Somerville (2), B.G.D. Smart (2)

(1)School of GeoSciences, University of Edinburgh, UK, (2)Institute of Petroleum Engineering, Heriot-Watt University, Riccarton, Edinburgh, UK, (3)Weatherford Production and Completion Systems Expandable Technology, Aberdeen UK

(Salima.Lokmane@pet.hw.ac.uk / Fax: +44 131 451 3127 / Phone: +44 131 451 3189)

The correlation between measured permeability and petrographical parameters in cored samples can be used by extrapolations or interpolations to predict permeability in uncored intervals, in cases where the direct measurement of permeability is not available. The core analysis described here is concerned with the study of fluid-rock interactions in rock samples obtained from three sandstone reservoirs, in particular the effect of petrographical parameters on flow behaviour. The parameters involved are bulk porosity ($\hat{O}$), liquid permeability (k_l), gas permeability (k_g), mean grain size (MGS), and volumes fractions of quartz, clay and cement. A correlation between liquid permeability and the volume fraction of quartz is clearly demonstrated. Liquid permeability also increases with increasing mean grain size and decreasing volume fraction of clay and cement. Liquid permeability was correlated using multi-variate regressions to one to five petrographical parameters. The best model according to all criteria (maximum correlation coefficient (R^2), minimum standard deviations (S.D.) and maximum Akaike's Information Criterion (AIC)) is k_l = (SiO_2) + (MGS) – (Clay) + (Φ). The results obtained have useful application in the estimation of reservoir permeability where samples are not available for experimental testing.

Keywords: sandstone, permeability, petrography, laboratory study