STUDIES OF PRODUCING RESERVOIRS WITH THE NEUTRON LIFETIME LOG[1]

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ABSTRACT

Reservoir evaluations are made on information obtained at the time wells are drilled and completed and on the basis of reservoir performance. Important data normally available from open hole measurements include gas-oil contacts, water saturations, and water table levels. These parameters change as a reservoir is produced and the results manifest themselves as changes or a combination of changes in oil produced, water produced, gas-oil ratio, or bottom hole pressure. Many perplexing reservoir problems could be solved if changes in these parameters could be observed as the reservoir is produced to complement data observed in the borehole from the results of production. Such measurements in the hands of the reservoir engineer would be a powerful tool for refinement of reservoir evaluation.

The Neutron Lifetime Log gives a cased hole measurement of a formation parameter sensitive to the amount and type of fluid in the formations. This parameter, thermal neutron capture cross section, qualitatively distinguishes potentially productive intervals from non-productive intervals under a wide range of well bore conditions.

A single mathematical expression relates the contributions of the formation fluids in the pore volume and of the rock matrix to the capture cross section of the formation. Under favorable conditions, quantitative water saturations can be determined. Aside from the obvious application of capture cross section for identifying potentially productive intervals behind casing, this measurement has proven most valuable in reservoir analysis.

Well studies are presented indicating results observed from applying cased hole measurements of capture cross section to reservoir evaluation.

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