MEETINGS

LUNCHEON MEETING—JANUARY 9, 1989

R. V. EVERETT—Biographical Sketch

Bob Everett presently works for Schlumberger Well Services in New Orleans as Product Development Manager for Geochemistry. He has previously worked at Schlumberger-Doll Research Facilities and Canadian Schlumberger Operations. Bob graduated from the University of British Columbia and is the author of several papers dealing with geochemical logging. Bob is a member of SPE, AAPG, CWLS, SPWLA, CSEG, NOGS, and CSPG.

WIRELINE GEOCHEMICAL LOG ANALYSIS OF THIN BED RESERVOIRS GULF OF MEXICO

Reliable detection of low contrast pay sections in offshore Pliocene strata has been facilitated by the increased resistivity associated with the oil and gas over the associated shales and water zones. However, the contrast in resistivity is often more difficult to detect in some reservoirs. Consequently, low-contrast reservoir horizons may be overlooked.

Detailed lithological studies reveal that in many cases the subtle low resistivity reservoirs consist of thin alternating laminae or beds of sandstone and shale. Core plugs usually indicate the sandstone lenses have low water saturations, high resistivity and good porosity. Associated shaly layers have limited porosity and permeability, high water saturations and low resistivity. Proper evaluation of porosity and fluid saturation is difficult as the vertical resolution of many wireline services is too large to resolve the true properties of the thinly layered hydrocarbon productive sandstones. The wireline log response reflects the average water saturation and porosity of both the productive sand and the non-productive shale layers.

Evaluation of thinly layered reservoir rocks is facilitated by an integration of wireline log data and data derived from detailed evaluation of core samples. This talk addresses one method of integrating core evaluation with geochemical wireline log measurements.

The objective is to compare wireline geochemical methods and traditional methods to determine if the geochemical evaluation has any advantages over traditional evaluation for thinly bedded reservoirs. In the example well, the wireline geochemical method measures higher hydrocarbon volume in a thin-bed reservoir. The higher hydrocarbon volume results from higher computed effective porosity from the geochemical method. Porosity is verified from core measurement, but since only sidewall cores rather than whole-core plugs are available, porosity agreement is considered to be a qualitative verification. Quantitatively, the wireline geochemical method is used to calculate and compare to core measurement, values of cation exchange capacity from a knowledge of clay types and abundances.

The wireline geochemical method uses "a geochemical model" that has been calibrated with several hundred core plug measurements of elements, minerals, porosity, cation exchange capacity, grain size, and permeability from previous studies. The mineralogy defined by the geochemical model provides the basis for defining tool responses needed for interpretation of the solid portion of the rock. Additional wireline measurements provide information for the fluid portion of the rock. Combining the fluid analysis and the mineralogy provides the calculation of hydrocarbon reserves. The wireline geochemical method requires one more logging run which collects over twice as much data as traditional logging runs.

From a comparison of the wireline geochemical method with traditional methods, we conclude that the mineralogy derived from the elemental log measurements provides clay fractions that are confirmed by cores thus contributing to the evaluation of thinly bedded reservoirs.