MOWATT, THOMAS C., Reservoirs, Inc., Denver, CO

Reservoir Potential of Cretaceous Rocks, National Petroleum Reserve in Alaska

Petrographic, x-ray diffraction, and scanning electron microscope studies of core samples from Cretaceous units in nine wells from the National Petroleum Reserve in Alaska (NPRA), evaluated in the context of other available information, suggest that reappraisal of regional petroleum resource potential may be warranted. Evidence of secondary porosity development, together with the character of much of the Cretaceous section, indicates the potential for reservoir rocks to have been developed diagenetically. Heretofore, it has been held that significant reservoirs were unlikely in these units.

Consideration of other regional factors, including geothermal gradients, degree of maturation of organic materials, and structural and stratigraphic relationships, indicates potentially favorable conditions for development of secondary porosity elsewhere within the subsurface of NPRA, in rocks similar in nature to those studied. These same geologic factors are not inconsistent with regional potential for the generation and accumulation of hydrocarbons as well.

Continental, shoreline, and nearshore depositional environments are recognized as predominant throughout the Cretaceous in this region. Thus, associated organic material is likely to be predominantly terrigenous in character. This factor has led to consideration of the region as essentially "gas prone." However, recent reported work in NPRA and elsewhere indicates the possibility of generation of significant amounts of liquid hydrocarbons from at least some of these types of organic matter.

NATIONS, D. L., D. E. TABET*, and C. R. GEROULD, Anaconda Minerals Co., Denver, CO

Computerized Coal-Quality Prediction from Digital Geophysical Logs

A digital suite of geophysical logs, including gamma-ray, resistivity and gamma-gamma density, were used to develop and test a method for predicting coal quality parameters for the Wyodak coal in the Powder River basin of Wyoming. The method was developed by plotting the average of various log response increments (obtained from the contractor's 9-track digital tapes) versus the analytically determined ash, moisture, and Btu/lb for the same intervals of the coal seam. Standard curve-fitting techniques were then employed to determine which log response parameter most accurately predicted the various quality parameters. A computer program was written that reads 9-track, digital, log tapes and determines the coal quality parameters based on the relationships between log response and analytical values. The computer program was written in Fortran 77 for a VAX 11/780 minicomputer. The program was designed to run interactively with user-determined options depending on which geophysical logs were available. Preliminary results have been very encouraging to date with predicted versus analytically determined parameters being estimated to an accuracy of ±300 Btu/lb (with the average being ±150 Btu/lb), ±2% ash and ±3% moisture. This compares to ASTM lab-to-lab analytical standards of ±100 Btu/lb, ±0.7% ash, and ±0.5% moisture. This prediction method is applicable to coals from other basins and offers promise as a cost saving tool for exploration and production uses.

NATIONS, DALE, Northern Arizona Univ., Flagstaff, AZ, A. K. DOSS and RUDY UBARRA, Arizona Oil and Gas Commission, Phoenix, AZ

Oil and Gas Exploration and Development in Arizona

Recent oil and gas exploration activity has been widespread throughout Arizona. Development drilling has continued in the Dineh-bi-keyah and Teec-nos-Pos fields in the northeastern corner, and exploratory drilling continues to test potential Paleozoic reservoirs elsewhere on the plateau. Several shallow wells north of the Grand Canyon encountered shows and limited recoveries of oil from Permian and Triassic rocks.

The greatest activity has occurred along the "Overthrust trend" from northwestern to southeastern Arizona. Several million acres were leased and eight exploratory wells drilled along this trend. None were discoveries, but the presence of a Laramide thrust fault in the vicinity of Tombstone was established. The other tests have neither proved nor disproved the concept of the Overthrust belt in southern Arizona.

Recent discoveries in the nonmarine Tertiary and marine Paleozoic of southern Nevada have stimulated interest in the oil potential of similar rocks and structures in the Basin and Range province of Arizona, which are coincident with the Overthrust trend. Reported gas discoveries by Pemex in Miocene marine sediments of the Gulf of California have stimulated leasing in the Yuma area, where one uncompleted well is reported to be a potential producer.

The Pedregosa basin of extreme southeastern Arizona remains an area of great interest to explorationists because of the presence of a 25,000-ft (7,600-m) sequence of Paleozoic marine sediments similar to those of the Permian basin, and Cretaceous marine rocks, including coral-rudist reefs, similar to those that produce in Texas and Mexico.

OLDOW, JOHN S., Rice Univ., Houston, TX, and RAVINDA S. TIPNIS, Texas Southern Univ., Houston, TX

Evolution and Petroleum Potential of Mesozoic Marine Province of Northwestern Great Basin

The Mesozoic marine province of the northwestern Great Basin consists of late Early Triassic through Early Cretaceous volcanic, terrigenous clastic, and carbonate rocks. The rocks were deposited in a basin that was probably open to the north and bound on the west by the Sierran arc and on the east and south by continental uplands. Basin configuration was controlled by an enclave of noncontinental crust whose areal distribution and mechanical properties localized development of marine conditions in the region.

The deep axial region of the basin progressively shoaled during the Triassic and regionally extensive shallow marine carbonates and easterly derived clastics migrated westerly, overlapping deep marine clastics and subaerial to shallow marine volcanics interbedded with carbonates. In the Early Jurassic, depositional patterns changed. Basins, possibly related to regional extension, formed and accumulated locally derived coarse clastics and craton-derived quartz sandstones. Later, during continued synorogenic deposition, volcanogenic rocks were introduced in the west and migrated easterly.

Several hundred kilometers of stratal shortening associated with the Luning-Fencemaker thrust belt formed in response to northwest-southeast regional contraction, which began in the Middle or Late Jurassic and continued through the Early Cretaceous. Rocks deposited on the western flank of the basin did not experience northwest-southeast contraction and were separated from the thrust belt by a northwest-striking left-lateral transpressional fault, the Pine Nut fault. At about 100 Ma, thrusting ceased and transpressional motion reversed and became right-lateral.

Source-rock evaluation of thick, regionally extensive Upper Triassic carbonates has yielded TOC values ranging from 0.20 to 0.48 and conodont color indices (CAI 3.5-4.5) indicating paleotemperatures of about 180° to 250°C. Kerogen analysis indicates that the dominant organic matter is sapropelic to amorphous and in one area suggests the presence of the oil window. Hydrocarbon generation within the carbonate is a distinct possibility.

OSMOND, JOHN C., Consultant, Englewood, CO

Petroleum Occurrences Associated with Uinta Mountains, Utah and Colorado

The Uinta Mountains in northeastern Utah and northwestern Colorado are among the rare major structures in the western United States with east-west trends.

The east-west trend may have an ancestry in a Precambrian aulacogen and a lower Paleozoic arch. The area was quiescent until the Paleocene or Eocene when the mountain block began to rise and the basins on the north and south subsided. The mountain block cuts across north-south-trending arches formed during the Cretaceous, and it uplifted the belt of Sevier-Laramide overthrusts. The eastern part of the mountain block collapsed during the mid-Tertiary.

The range is an anticline with a core of Precambrian metasediments and steeply dipping Paleozoic and Mesozoic rocks on the flanks. Tertiary debris from the mountains overlaps onto older rocks.