13. ALONZO D. JACKA, Texas Technical College, Lubbock

DEPOSITIONAL DYNAMICS OF ALMOND FORMATION, ROCK SPRINGS UPLIFT, WYOMING

In the Rock Springs uplift of Wyoming, the late Cretaceous Almond formation consists of a lower alluvial unit and an upper transitional and marine unit which exhibits cyclic deposits. Typical cycles display the following sequence of units from the base upward: (1) marine and/or lagoonal shale, (2) barrier island sandstone unit, (3) marsh or mud flat deposits, and (4) lagoonal or bay deposits. These rhythms reflect the lateral shifting of three contemporaneously existing depositional entities: (1) marine environment—in which surfzone and infra-surfzone sands, and offshore muds accumulated; (2) barrier island environment—consisting of foreshore beach, backshore beach, and fringing marsh or mud flat deposits; (3) lagoonal environment—in which predominantly fine-grained sediment, carbonaceous material, and oyster reefs accumulated.

The barrier island sandstone units display a characteristic sequence of sedimentary structures that reveals their origin. This succession of primary features records the building-up of the sea floor until it emerged and a beach was formed.

Evidence indicates that seaward growth of barrier islands was accompanied by an expansion of the lagoons which resulted in a progressive flooding of the landward margins of the barriers. Thus positions previously occupied by a barrier island were successively blanketed with lagoonal deposits. As the distance between a seaward-advancing barrier island and the mainland increased, a threshold limit was approached beyond which the amount of sand supplied to the seaward face was insufficient to permit further seaward growth. The operation of negative processes (subsidence, compaction, erosion, and perhaps an independent rise in sea-level) soon brought about the submergence or "drowning" of an abandoned barrier.

The effects of a rapid transgression were mimicked as lagoons merged with the open sea and marine conditions were rapidly extended to the edge of the mainland. Emergence of a new chain of barrier islands near the mainland shore initiated another cycle. Thus rhythmic seaward migration, progressive isolation, cessation of growth, and submergence of barrier islands simulated the effects of slow regressions and rapid transgressions and produced the cyclic deposits.

Similar ancient barrier island units are present in other Cretaceous formations both in the Rock Springs uplift and in numerous other localities.

14. JOHN L. STOUT, California Oil Company, Denver, Colorado

PORE GEOMETRY AS RELATED TO CARBONATE STRATIGRAPHIC TRAPS

The increase of oil exploration in carbonate provinces requires a better understanding of stratigraphic entrapment. Photomicrographs of reservoir and trap rock from a Nesson anticline field in North Dakota illustrate this problem. The pore geometry and petrology of rocks with a similar relation would be beneficial to the exploration geologist.

A schematic diagram illustrates the interstices of a reservoir rock. The total porosity is a ratio of the rock's void space to its bulk volume. Under subsurface reservoir conditions, this porosity is occupied by fluid of two phases. The non-wetting oil phase occupies this porosity according to the size and distribution of the rock's pore system. The displacement of interstitial water by oil depends on the size of pore throats. What is not effectively displaced by oil remains as irreducible water saturation within the reservoir.

In the laboratory, the mercury injection method of capillary pressure measurement simulates these reservoir properties and pore size and equivalent reservoir characteristics can be calculated. The capillary pressure curves may be investigated by the same statistical methods used on cumulative curves from sieve analysis of unconsolidated sands. The hysteresis of the capillary pressure curve depends on the vuggy makeup of the rock.

Seven distinctive petrophysical characteristics were evident from two hundred samples of Williston basin carbonate rocks studied. These characteristics may be classified by displacement pressure, effective porosity, and pore distribution. Examples of typical rocks show good and intermediate reservoir rock and a specific reservoir-trap rock. A photomicrograph of reservoir rock with low effective porosity gives an insight into the reason for expecting highly water-cut production from carbonate reservoirs. This petrophysics is independent of the porosity and permeability routinely measured on reservoir rock.

Stratigraphic entrapment of oil in a field example is explained by petrophysics of the reservoir and trap rock. These petrophysical distinctions can be observed from sample examination without extensive laboratory measurements.

15. GARY S. SANDLIN, Pubco Petroleum Corporation, Denver, Colorado

SLEEPY HOLLOW FIELD OF RED WILLOW COUNTY, NEBRASKA

The Sleepy Hollow field, on the southwest flank of the Cambridge arch, is a recently discovered oil field of major importance which produces from multiple pay zones at a relatively shallow depth.

The oil accumulation is partly controlled by a structural nose, trending south-southwest across the field. A large area of limited reversal may be mapped near the center of the field.

Good porosities across the southern half of the field are responsible for production from the Lansing-Kansas City limestones. The principal producing limestone of this group is the C zone. The build-up of porosity in the C zone is a part of a porosity trend which can be traced for a considerable distance east and west of the field.

Production from the basal sand is controlled by an oil-water contact on the flanks of the structure and by a pinch-out or truncation of the sand at the northeast end of the field.

Cumulative production from the Sleepy Hollow field exceeds 10 million barrels. The Lansing-Kansas City has contributed approximately 3 million barrels and the basal sand has produced approximately 7 million barrels.

The wells in the field average 3,500 feet in depth and can be completed for less than $40,000.

16. JAMES A. BARLOW, JR., D. N. MILLER, JR., AND JOHN D. HAUN, Barlow & Haun, Inc., Casper

STRATIGRAPHY AND PETROLEUM POTENTIAL OF LATEST CRETACEOUS ROCKS, BIG HORN BASIN, WYOMING

Approximately 2,500 feet of Upper Cretaceous post-Cody non-marine sediments in the southwestern part of the Big Horn basin interfinger toward the north and east