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Abstracts

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Dolomitization Stages in Regressive Sequence of Hunton Group, Anadarko Basin, Oklahoma

The Upper Silurian Henryhouse Formation, of the Hunton Group (Upper Ordovician–Lower Devonian), is a major hydrocarbon reservoir in the Anadarko basin. Detailed examination of Henryhouse cores were conducted at many localities in the basin, west of T10W. Sedimentary structures, lithology, fossil content, and fabric relationships were used as criteria to recognize various depositional facies. Subtidal, intertidal, and supratidal facies can be distinguished readily, and their spatial relationships consistently indicate a shallowing-upward sequence. Previously unreported nodular anhydrite (replaced and unreplaced) occurs at the top of the sequence, suggesting that hypersaline conditions developed in supratidal environments.

Three stages of dolomitization were documented in the Henryhouse Formation. Petrographic, cathodoluminescent, and isotopic techniques were used to investigate the genesis and textural relationships of various dolomite types. The following paragenetic sequence was discerned: (1) penecontemporaneous hypersaline dolomite occurring as brownish, hypidiotopic, 60-80 μm rhombs concentrated in the supratidal and intertidal facies; (2) marine-water and freshwater mixed dolomite occurring as white rims around preexisting hypersaline dolomite and as anhedral, white rhombs in vugs and molds; (3) deep burial vug, mold, and fracture-filling baroque dolomite.

Cathodoluminescence reveals that typical Henryhouse dolomite exhibits dull luminescing cores with other bright rims corresponding to the dark core and light rim seen in plane light. This zonation represents two stages of dolomitization.

Oxygen isotope ratios range from -2.2 to 9.9 ‰ (mean -4.6) vs. PDB, whereas the carbon isotope ratios range from 0 to +3.3 ‰ (mean +1.4) vs. PDB. The considerably light $\delta^{18}O$ reflects a freshwater influence. Values of $\delta^{13}C$ may represent initial composition because of their resistance to alteration.

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Geology of McMordie and Hale Ranch Fields, Roberts County, Texas

The McMordie Ranch and Hale Ranch fields produce from multiple stratigraphic traps representing several depositional environments. The fields, located in the southwestern Anadarko basin northeast of the Amarillo uplift, are traversed by the prominent northwest-southeast-trending Lips fault. Major down-to-the-northeast displacement along this fault during the Early Pennsylvanian affected deposition of the lower and middle Morrow. The McMordie Ranch field produces from multiple stratigraphic traps in the lower and upper Morrow, Cherokee granite wash, and Douglas sandstones on the downthrown side of the Lips fault. The producing lower Morrow sandstone, which occurs only on the downthrown side, reaches a maximum net-pay thickness of 34 ft (10.4 m). This sand facies appears to be a beach or offshore bar, 1 mi (1.6 km) wide and 2 mi (3.2 km) long, deposited parallel to a shoreline controlled by the Lips fault. In the upper Morrow, two distinct reservoir facies are recognized—point bars and stream mouth bars, which were deposited on a southeast-sloping delta plain. The lower Cherokee Group contains two productive granite wash sandstones, which were deposited near the distal north edge of a fan-delta complex sourced from the Amarillo Mountain uplift. The productive sections are each 8-14 ft (2.4-4.3 m) thick with variable porosity development. The shallowest reservoir in the field is the lower Douglas sandstone, an east-west-trending channel sandstone, 10-15 ft (3-4.5 m) thick and approximately 0.5 mi (0.8 km) wide.

The one-well Hale Ranch field produces from the Lower Mississippian Kinderhook sandstone in a fault block on the upthrown side of the Lips fault. This 16-ft (5-m) thick sandstone averaging 10% porosity is interpreted as a northwest-southeast-trending barrier bar encased in shale. Characteristically, this sand shows an excellent SP deflection, despite a high gamma-ray reading due to the thorium content in the sand.

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Misener Strike-Valley Sandstone Reservoir, Grant and Garfield Counties, Oklahoma

The Middle and Upper Devonian Misener sandstone reservoir in Grant and Garfield Counties, Oklahoma, is a prolific but elusive hydrocarbon target. Isolated pods of dolomitic sandstone are preserved in strike-valley erosional lows cut into the underlying Sylvan Shale. Source of the Misener sand appears to have been Simpson sandstone, which subcrops to the north and east. This sand was originally transported south-southwest onto the Sylvan subcrop by a fluvial system. The path of this drainage system is indicated by reentrants of the Viola Limestone subcrop downdip into the Sylvan Shale subcrop. During the Late Devonian marine transgression, which culminated in the deposition of the Woodford Shale, these fluvial deposits were reworked into marine sands and concentrated along several strandlines during stillstands of the Woodford sea. Three distinct Misener trends are evident based on present well control: one adjacent to the Viola subcrop, one at a medial position in the Sylvan Shale subcrop, and one adjacent to the Hunton Limestone subcrop. Reservoir distribution along these strandlines is extremely erratic.

Reservoirs average 250 ac in extent and attain a maximum thickness of 60 ft. Primary production has ranged from 100 to 160 bbl of oil/ac-ft. Early institution of reservoir pressure maintenance can allow recovery of nearly 60% of the original oil in place.

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Seismic Anomalies Associated with Morrowan-Atokan Production in Norcan-Fager Fields, Clark and Ford Counties, Kansas

The Norcan-Fager fields, discovered in 1980, are stratigraphic traps that produce from northwest-southeast-trending pods of sandstone of Morrowan-Atokan age. The discovery well of the Norcan field, Ladd Petroleum 1-8 Norton, was drilled on a seismic anomaly recognized on 12-fold vibroseis data. Subsequent development drilling was guided by mapping these seismic anomalies, which reflect the drainage pattern incised on the Mississippian carbonates. This topographic surface controlled subsequent deposition, and the Morrowan-Atokan sandstones were deposited in topographic lows.

These seismic anomalies are associated with the Mississippian unconformity surface rather than the productive sandstones; they appear to be unique to the study area, and they vary in character. The most common features associated with the lows on the Mississippian unconformity surface are: (1) diffractions; (2) high-amplitude "bright spots"; (3) breaks in the seismic continuity of the Mississippian reflector (if present); (4) sagging in the overlying section due to differential compaction; and (5) sagging of the Mississippian reflector. The anomalies usually occur in differing combinations across the study area, and these combinations are con-