

N. C. ELMER, Sohio Petroleum Company, Billings, Montana

Complex Entrapment at Sage Creek Field, Big Horn Basin, Wyoming

Sage Creek field is located on a well developed asymmetric fold in the northern Big Horn Basin of Wyoming. This structure trends northwest-southeast parallel with the Big Horn Mountain front, through T. 37 N., R. 97-98 W., in Park and Big Horn counties. It has about 500 feet of structural closure. The field consists of one Madison well producing 20° gravity oil, and 21 Tensleep wells producing 26° gravity oil. Ultimate recovery from both zones is estimated at approximately 1½ million barrels.

The Madison pool is of small areal extent and is a simple gravity accumulation in a zone of permeability well below the top of the formation. The Tensleep pool is of a more complex nature and consists of five separate oil accumulations in zones of porosity and permeability within an otherwise dolomitic Tensleep sand. These five "bubbles of oil" are displaced down the southwest or basinward limb of the structure by hydrodynamic activity of such an extreme type that the crest of the structure is water-bearing in all Tensleep zones.

The unique features of accumulation in this field indicate the need for thoroughness and caution in the evaluation of the Tensleep formation in wildcat wells.

WOLFGANG E. ELSTON, University of New Mexico, Albuquerque, New Mexico

Paleozoic Stratigraphy of Black Mesa Basin, Northeastern Arizona and Surrounding Areas

Paleozoic sedimentary rocks in the subsurface of the Black Mesa basin of northeastern Arizona include: 0-800 feet of Cambrian dolomite, sandstone, shale, and minor limestone; 0-300 feet of Devonian dolomite and sandstone; 0-500 feet of Mississippian dolomite and limestone; 0-500 feet of Pennsylvanian redbeds and limestone; and about 2,000 feet of Permian redbeds and eolian sandstone capped by 0-400 feet of dolomite near the western edge of the basin. These rocks do not crop out, and only a few wells have penetrated them to date.

Isopach and lithofacies maps show that in all Paleozoic systems the thick marine carbonate sections of northwestern Arizona and southwestern Utah pinch out, become more clastic, or interfinger with continental sedimentary rocks southeast in the direction of the Black Mesa. At no time during the Paleozoic or Mesozoic era was the Black Mesa area a basin in the sense that it was the site of deposition of marine sediments significantly thicker than in surrounding areas. The Black Mesa structural basin was formed by differential uplift in Cenozoic time. When the Colorado Plateau was uplifted the Black Mesa rose 3,500-7,000 feet less than surrounding areas.

Possibilities for oil and gas discoveries in stratigraphic traps seem best in the northern and western parts of the Black Mesa basin, where several permeable formations appear to pinch out.

RICHARD W. FETZNER, Sun Oil Company, Richardson, Texas

Pennsylvanian Paleotectonics of Paradox Basin

During Pennsylvanian and Permian time, the Colorado Plateau area underwent the most active period of tectonic activity of the Paleozoic and Mesozoic eras. A continuous parageosynclinal seaway extended from the Oquirrh sag of east-central Utah southeast into central New Mexico. Greatest subsidence occurred in the Paradox basin, an asymmetrical half-graben, where in excess of 6,500 feet of marine and restricted marine sediments accumulated during Pennsylvanian time. Peripheral to this seaway were the orogenic Uncompahgre-San Luis uplift, the epeirogenic Kaibab-Defiance-Zuni uplift, and the epeirogenic Emery uplift. Along the Uncompahgre and Kaibab-Zuni structural trends, tectonism originated earliest in their southeastern segments and progressed northwest.

Two elements, the Defiance uplift and a southeastward projecting spur of the Emery uplift, bear major economic implications. The Defiance uplift, a structural subsidiary of the Kaibab-Zuni trend, projected north into the southern Paradox basin. It was active in pre-Pennsylvanian time and affected depositional patterns of marine sediments from Morrow? to Wolfcamp in age. Major hydrocarbon production in the Four Corners area bears a close relation to this element geographically and geologically. Because of Kaibab-Zuni tectonism, only the northern third of the Black Mesa basin appears favorable for hydrocarbon accumulations in Pennsylvanian rocks.

The Emery spur projected into the northwestern Paradox basin and affected depositional patterns of sediments from Des Moines into Wolfcamp time. Geologic conditions east of the Emery uplift, and adjacent to its southeastern spur, appear more favorable for hydrocarbon accumulations in Pennsylvanian sediments than those present in the producing part of the Four Corners area. Recent discoveries on the western Paradox Basin shelf prove the presence of oil in marine sandstone stringers and reef-type build-ups within the Hermosa formation. Regional lithologic analyses indicate that this trend may be extended from the southern Emery flank to the northern Kaibab flank.