til Superior drilled the No. 1 Allred in 1951. Since that time there have been forty wells drilled in search of the basal Atoka and Cromwell gas. At present there are 30 producing wells, 10 dry holes, and 1 drilling well. Of these 30 producers, 17 are single zone basal Atoka wells; two are single zone Cromwell, and 11 dually completed Cromwell and basal Atoka. Development was at its maximum during 1961, when 11 wells were drilled. Air drilling was introduced to the area during 1960. This type of drilling has greatly reduced drilling costs and has accelerated development.

The total gas produced to date from the basal Atoka and Cromwell is 11.2 billion cubic feet. Recovery per acre foot from the basal Atoka is expected to be about 400,000 cubic feet of gas. The Cromwell is expected to have recovery factor on the order of 300,000 cubic feet of gas per acre foot. Based on 30 wells with an average of five billion cubic feet of gas per well, the total reserves developed to date in the basal Atoka is in excess of 150 billion cubic feet of gas; 50 billion appears to be in undrilled locations, so a total of 200 billion cubic feet of gas is the probable ultimate reserves in the basal Atoka.

The Cromwell produces from only 15 wells and probably averages five billion cubic feet gas per well, or a developed reserve of 75 billion. Proved locations should result in another 25 billion or a total of 100 billion ultimate reserves in the Cromwell.

The estimated ultimate recovery from both the basal Atoka and Cromwell gas zones should exceed 300 billion cubic feet of gas. Character of the gas from the two zones is almost identical; both have a BTU rating 980 and a specific gravity of .58.

April 15, 1963

Thomas A. Hendricks, U. S. Geological Survey, Denver, Colorado

"Petroleum Geology of the United States"[1]

Abstract

Crude oil originally in place in the United States and adjoining continental shelf is estimated at 1,600 billion barrels. One thousand billion barrels of this oil will be found by exploration, and 400 billion barrels will be economically producible. The remaining 1,200 billion barrels is in undiscovered pools too costly to find or is residual oil in proved reservoirs.

The estimate of the amount of oil originally in place is based on: a) exploratory footage already drilled, together with past production and proved reserves; b) the fraction of the total volume of sedimentary rocks that has been explored; and c) the relative attractiveness of the explored rocks to those as yet unexplored.

It is emphasized that these figures are for resources and not for reserves. In order for the oil that constitutes these resources to be promoted to the status of reserves, about 6 billion feet of additional exploratory drilling must be done and the economics of production of the oil must be consistent with demand.

[1]Abstracted from a manuscript on "World potential of oil, gas, and natural gas liquids," by A. D. Zapp, T. A. Hendricks, and J. F. Pepper.

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Philip A. Chenoweth, Sinclair Oil & Gas Co., Tulsa, Oklahoma

"Unconformity Analysis"

Abstract

Unconformities, at one time regarded as representing records of simultaneous world-wide events, and thereby forming the "ultimate basis of correlation," are now known to merge laterally along strike and to disappear down dip. A continuous sequence of types occurs, from high angle unconformities to paraconformities. Most significant to the oil geologist are the low angular unconformities, found commonly on the shelf and geosynclinal margin. These characteristically occur in repetition as the basin margin is continually flexing during deposition. Analysis involves interpretation of combined outcrop-subcrop-worm's eye maps to the end of reconstructing geologic history. Given an onlapping sequence of beds, thinning shoreward, one of four possible results may accrue: tilt may take place directly down towards the sea, at an angle to the shoreline, warping into a syncline, or upbending into an anticline. Secondary and subsequent sea advances may or may not conform to the earlier structure. Erosion produces bands of outcrop and facies either parallel to one another and to the unconformity, or outcrops diverging, crossing facies, and intersecting unconformities at an angle. Pattern depends on the type of fold or tilt; angles upon amount.

Southwest Arkansas is presented as an example of an area where repeated straight tilts have produced five major unconformities. Northeast Texas is a region of repeated synclinal downwarp; four major unconformities are shown. The Hunton anticline of central Oklahoma is an area of repeated upwarp; four unconformities are present.

May 6, 1963

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"Carbonate Sediments and Structures of the Campeche Bank, Yucatan"

Abstract

The Yucatan Shelf (Campeche Bank) is a deep, inclined shelf which projects into the southern Gulf of Mexico from the Peninsula de Yucatan. The shelf is approximately 22,000 square miles in area and extends 70-180 miles from the shoreline to a shelf-slope break in depths of 600 to 900 feet. The Peninsula do Yucatan and much of the seaward shelf are underlain by karsted limestones of Tertiary and Pleistocene age. There are no major rivers due to the karst topography of the hinterland. The effect of the small run-off influx is a lack of terrigenous detritus on the Yucatan Shelf. The late Quaternary sediments are pure carbonate types composed of skeletal and non-skeletal constituents. The skeletal component of shelf sediments is dominated by benthonic mollusca, corals, foraminifera and carcareous algae; non-skeletal grains include pellets, ooids, lithic (limestone) fragments and some aggregate grains. Emergent coral reefs, submerged reef banks and biostromes form a series of prominences above the shelf level around the outer margins.