

Stratigraphic Sequence Mapping Tool Aids Small Reservoir Development

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Recent surveys by the USGS and private, non-governmental sources suggest that significant volumes of hydrocarbons remain to be exploited in the onshore basins of the contiguous 48 states. The problem is that most of this resource base exists in small to medium-sized reservoirs. Exploration for and development of these reservoirs will challenge geologists and their financiers both technically and economically. It is important to state that while these reservoirs are small, they are no less important, especially to a country like the United States that finds itself increasingly dependent on important supplies of hydrocarbons. Development of small to medium-sized reservoirs could provide the United States a supply cushion that should mitigate against negative, politically motivated actions by foreign suppliers.

The author has considered this problem for over 20 years, and based on this analysis, he believes that traditional, seismic based exploration will not be a cost-effective solution to the search for these reservoirs in most domestic basins. He believes that new technologies or approaches will be required to search for these remaining reservoirs. Because the reservoirs are comparatively small, they will have significantly reduced exploration budgets, and (perhaps unrealistic) equal high demands on successful drilling. The methodology developed by the author follows the technical ideas proposed by A.I. Levorsen (AAPG Bull., 1936, Vol. 20, No. 5, pp. 521-530, AAPG Bull, 1966, Vol, 50, No.10, pp. 2058-2067) and R. L. Scholten (AAPG Bull., 1959, Vol.43, No.8, pp.1793-1833) among others. These papers cite the importance of stratigraphic and stratigraphic-diagenetic reservoirs in trapping of hydrocarbons. The methodology developed by the author provides an answer to the search for stratigraphic trapping.

The author has success in using a stratigraphic sequence based mapping method to identify and evaluate these small to middle-sized reservoirs. By identifying stratigraphic sequences on well logs or sample logs and using these data to develop paleogeomorphic maps, an understanding of the lithologic and diagenetic changes that contribute to localized trapping of hydrocarbons is obtained. By supplementing the mapping technique with other low-cost tools, like surface geochemistry, a low-cost exploration program can be completed which only minimally impacts the promotional costs for the well.

The author has been using such a technique for 20 years, and has identified the following benefits by its use:

- 1) Use of the paleogeomorphic mapping technique allows a better understanding of the often subtle lithologic changes that can affect reservoir formation and hydrocarbon trapping.
- 2) The methodology has been used successfully to model stratigraphic reservoirs, including very subtle carbonate traps, like reefs, and clastic traps, like small channel deposits.
- 3) This methodology has increased the chances for success in drilling to a success rate as high as seven (7) economic wells out of ten (10) drilling attempts.
- 4) In developmental situations, the methodology has identified extensional or overlooked drilling locations, including those in fields considered to be mature.
- 5) In new exploration situations, the methodology has been used to streamline exploration programs, including lease acquisition and seismic line purchases.
- 6) When applied with great detail and supplemental well cutting or core studies, the methodology can be used to document the theoretical or controlled scientific observations made by other geoscientists in the field or laboratory.

In this presentation, the author will provide examples of small to medium-sized reservoirs that have been modeled by his technique.