LOG CHARACTERISTICS OF DIAPIRIC SHALES

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ABSTRACT

High-pressure diapiric shales, commonly associated with domal structures along the Texas and Louisiana Gulf Coast, characteristically exhibit low values of resistivity, density, and acoustic velocity. Thus, well logs enable identification of these intrusive shale masses.

However, deep-water marine shales—such as are source beds of diapiric shales—are also high-pressure formations and exhibit similar log characteristics in their normal stratigraphic positions. Therefore, although logs of the above-mentioned parameters indicate domal shale core may have been penetrated, additional data are required for confirmation.

Dipmeter surveys provide information to confirm or deny the intrusive nature of the shale. In addition, if the shale is found to be intrusive, dip information locates the well position with respect to the apex of the diapir. As the shale diapir is approached from above, dips (away from the apex) increase in magnitude—just as if a salt dome were being approached. Once the low-resistivity shale is penetrated, the dips are relatively constant in both magnitude and azimuth. The dips approximate that of the contact between the bedded formations and the diapiric shale. This consistent dip within the domal core is quite different from the random dips found in gouge shale adjacent to piercement salt domes.

In an offshore field, resistivity values were used to map the top of a shale dome. None of the wells drilled on this strucure encountered salt. The deepest penetraton of the domal shale was approximately 2000 feet. Contour lines were drawn on basis of depths at which the various wells encountered a decrease in shale resistivity to one-half ohm-meter. The map indicates a minimum closure of 6000 feet. Dips computed from the map agree closely with those measured within the domal shale by dipmeter surveys.