Recognition of Vertical Versus Horizontal Water Drive Offers Infill Opportunities in Mature Reservoirs: Portilla Field, San Patricio County, Texas

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ABSTRACT

Portilla Field represents one example from numerous oil-productive structural closures along the Gulf Coast. In the case of Portilla, an underlying shale diapir deformed highly porous and permeable Frio sandstones into a dome-shape. The focus of this paper is the Middle to Lower Frio sandstones named for their approximate depth, Frio (7,300 ft), Frio (7,400 ft), and Frio (8,100 ft). All wells completed in these reservoirs develop a high water cut from an active water drive. By 1956 the field appeared fully developed in the three main reservoirs. After 1956 about 10 infill wells were added on the top of the structure. Oil/water contacts in the infill wells varied, but not according to structural position.

Many geologists and engineers assume that wells on the structural flank develop a high water cut due to a horizontal or edge water drive. But many wells are also swept vertically from water beneath an oil/water contact. Abraxas tested the concept by drilling the Welder #85 well at a location off the structural crest. The Frio (8,100 ft) reservoir contained 28 ft of net oil pay over water, and its oil/water contact is 46 ft lower than that of the highest well in the field. The distance from nearest wells is about 650 ft, and if drainage area between wells is equidistant, the well could drain 10 acres and recover about 116,000 BO (barrels of oil).

Abraxas is continuing to test the strategy of downdip infill drilling with additional wells. Many Gulf Coast reservoirs may benefit from recognition of vertical water drive (coning) in individual wells versus presumed horizontal edge water drive.

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