but differences between high and low resistivities can reflect differences in original environment of sand deposition.

Diagenesis can add significant quantities of clay to a rock through chemical precipitation in pore spaces. Diagenetic (authigenic) clays are of importance because they can significantly effect electric-log response (SP, gamma ray, neutron, density), and can largely control the reaction of a sand reservoir to well-bore fluids. It is often forgotten that diagenesis can also remove clays from a sandstone, thereby "cleaning-up" an originally dirty sandstone.

The composition of drilling and stimulation fluids also has a significant effect on reservoir quality, especially when the sandstone pores are lined with diagenetic clays. Use of incorrect drilling or stimulation fluids can make a potentially good reservoir nonproductive.

In the Pliocene-Pleistocene section of the Gulf of Mexico, variations in environment of deposition, diagenesis, and the composition of drilling fluids can play havoc with interpretations based solely on log characteristics.

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Environment of Deposition of Upper Wilcox Sandstones, Katy Gas Field, Waller County, Texas

At Katy gas field, sandstones of the upper Wilcox Group produce gas at depths of 10,021 to 11,000 ft (3,054 to 3,353 m) in reservoirs controlled by stratigraphic and structural characteristics. Producing zones are from 6 to 42 ft (1.8 to 12.8 m) in the upper Wilcox "First Lower Massive" sandstones, and "D," "C," "B," "A," and "Second Wilcox" interbedded sandstones and shales. The reservoir sandstones are dip-trending with production being localized on the top of the anticline.

The upper Wilcox sequence has been interpreted as delta-front grading upward to bay-marsh transitional deposits and, alternately, as deep-water turbidite deposits. The field is located downdip from the Wilcox fault zone, downdip from known delta-destructional deposits in the upper Wilcox, and is as much as 45 mi (75 km) downdip from the postulated late Sabinian shoreline. Full-diameter cores from the upper Wilcox sequence show the sandstones are submarine, constructional-channel turbidites, giving way vertically to thinner turbidite sandstones in a predominantly shale section. The sandstones are representative of submarine fan deposits, having bedset associations characteristic of channel deposits (A, AB, and ABD) becoming middle fan associations (AE, BE, ABCE, and BCE) and then outer fan associations (ABE, BDE, CDE, and DE) upward in the section. The thicker channel sandstones show limited lateral extent along strike, grading to thin, overbank sandstones.

Sandstones are sparsely bioturbated, and shales are bioturbated only when they overlie sandstones. The burrows are characteristic of a wide range of water depths from middle neritic to bathyal. Benthonic forams found in the cores are abraded by transport and represent a range of water depths from middle to outer neritic. Therefore, water depths during Wilcox deposition were probably bathyal, as indicated by deeper water trace fossils.

The deposition of the upper Wilcox Group is associated with transgression during late Sabinian and incipient uplift of a deep-seated, diapiric mass under the field. Electric-log correlations and sandstone isopach maps suggest that the sands were deposited as parts of a submarine fan that shifted northeastward through time.

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Cap-Rock Formation and Diagenesis, Gyp Hill Salt Dome, South Texas

Cap rock from Gyp Hill salt dome, Brooks County, south Texas, was formed by salt dome dissolution that left a residuum of anhydrite sand, which was subsequently cemented by gypsum and at a later time altered to gypsum by fresh meteoric groundwater. The cap rock consists of gypsum at the surface (0 to 90 m) and gypsum-cemented anhydrite above the salt (90 to 273 m). Samples from the salt contain 13 to 42% disseminated anhydrite crystals and $<$1.0% dolomite rhombs in halite. The cap-rock–salt boundary is marked by a cavity several meters high. Salt dissolution has concentrated the insoluble material into an anhydrite sandstone with 20% porosity at the base of the cap rock. Cap rock porosity is largely occluded within 6 m above salt by poikilotopic gypsum cement and crushed anhydrite laths (presumably from the overburden pressure of the cap rock). A transition zone occurs between 90 and 120 m below the surface where anhydrite is being completely hydrated to gypsum. Above this zone, the cap rock is entirely gypsum and indicates flushing by fresh meteoric groundwater. Through the total thickness, anhydrite is in disequilibrium, as evidenced by the gypsum cement and embayed anhydrite laths.

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Live Oak Delta Complex—Unstable, Shelf-Edge Delta in Deep Wilcox Trend of South Texas

Detailed correlation and study of approximately 500 well logs from the deep Wilcox trend of south Texas have shown at least three major deltaic complexes in the Rosita delta system. These sandstone-bearing units, previously considered to be a lower Wilcox strike-transported, shelf-edge sand facies, are reinterpreted as upper Wilcox deltas that prograded across a stable shelf to an unstable shelf margin.

The Live Oak delta complex, the youngest observed, consists of numerous lobes. The youngest of these, the Luling and Slick deltas, are both extensively growth-faulted and show a downdip change from delta plain to pro-delta facies. Areas of maximum net sandstone occur in the downdip part of the growth-fault zone where rapid relative subsidence rates compensated for basinward decrease in sandstone percent. A gulfward displacement of facies and associated growth faults occurred between deposition of the older Luling to deposition of the younger Slick delta. This suggests that the deltas prograded out to the shelf margin and that the associated growth faults reflect gravity instability