Characterization of Pennsylvanian Bridgeport Sandstones in the Illinois Basin, Lawrence Field

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Twelve percent of the production in Illinois is attributed to Pennsylvanian sandstones in mature fields. Many of these fields have reached their economic limit and are prime candidates for implementation of Enhanced Oil Recovery (EOR) techniques.

Characterization of the Pennsylvanian Bridgeport A, B, and D sandstones for an Alkaline Surfactant Polymer pilot study in Lawrence Field, Illinois, revealed a complex depositional regime that appears to be, in part, tidally influenced. Detailed core descriptions from six pilot wells in conjunction with dense geophysical log data led to the development of facies models showing rapid spatial changes responsible for compartmentalization of Bridgeport sandstones. This is important for the identification of flow unit configuration, a critical requirement for the success of EOR projects.

Reservoir geometries were mapped utilizing 50 percent clean sandstone measurements from normalized SP curves and gamma logs. The resulting maps indicate the need for classification of subdivisions within the individual Bridgeport sandstones for the purpose of defining and effectively enhancing recovery from reservoir compartments. Sandstones immediately underlying the Bridgeport D, and stacked sandstones above the Bridgeport B, often have subtle log inflections, which could indicate vertical communication between compartments. Minor sub-regional shales within the Bridgeport C interval have the potential to be used as supplemental correlation markers. Permeability barriers in the form of secondary precipitation of pyrite and calcite were identified in core descriptions and correlated on geophysical logs. Work continues on identifying additional sub-regional correlation features on logs and core to further characterize flow units for effective EOR implementation.