

Depositional Environment, Reservoir Characteristics, and EOR Potential of an Incised-Valley Fill: Pleasant Prairie Field, Haskell County, Kansas.

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Incised-valley fills form important but highly variable petroleum reservoirs with complex internal facies relationships. Upper Mississippian Chesterian rocks filled an incised valley during transgressions in the Hugoton Embayment of southwestern Kansas. Previous studies of the paleovalley indicating deposition in a tide-influenced estuarine system focused on its more southerly parts in the Wide Awake, Shuck, and South Eubank fields. Cores in Pleasant Prairie field in Haskell County, Kansas, near the northernmost preserved limit of the paleovalley, indicate a more river-influenced depositional environment.

Facies described in the Pleasant Prairie cores include conglomerate, conglomeratic sandstone, cross-laminated sandstone, and trough cross-bedded sandstone with abundant mud drapes. The conglomerate facies contains limestone clasts and is tightly calcite-cemented; conglomerates thus appear as low-porosity limestone on neutron-density and photoelectric well logs. Well-log correlation shows lateral continuity of a thick, low-permeability conglomerate, indicating a flow baffle compartmentalizing the reservoir. The lateral persistence of the conglomerate bed reflects a significant event in the filling of the paleovalley, indicating multi-stage filling. Cross-laminated sandstone and trough cross-bedded sandstone facies are the highest-quality reservoir rocks ($K=78-243\text{Md}$, $\text{Phi}=11-12\%$), however zones of dead oil are present in these facies.

Pleasant Prairie field is currently under consideration for tertiary recovery. Reservoir compartmentalization, petrophysical characteristics of facies, and dead oil zones revealed in this study have implications for future development of Pleasant Prairie field, as well as reservoirs with similar facies and depositional environments such as the Arapahoe and Stockholm Southwest fields, Lower Pennsylvanian Morrowan reservoirs in the Stateline trend.