THE FASCINATING GEOLOGY OF THE KISBEY FIELD, SOUTHEAST SASKATCHEWAN

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The Kisbey Field, located along the northeastern flank of the Williston Basin in southeastern Saskatchewan, has produced nearly 7 million barrels of light gravity oil since the discovery well was drilled in early 1985. The total recoverable reserves of the Kisbey Field is estimated to be approximately 16 million barrels of oil from three stratigraphic Mississippian (Madison) intervals. Current daily production exceeds 2300 barrels of oil per day.

The Mississippian Madison Group in the Williston Basin is comprised of the Lodgepole, Mission Canyon, and Charles formations. Production at the Kisbey Field is from the Frobisher, Kisbey, and Alida beds, which are stratigraphic units in Canada. These beds have been further subdivided in the United States portion of the basin into members based on progradational cycles (paracycles). Production at the Kisbey Field is, specifically, from the Mohall member of the Frobisher beds, the Kisbey sand, and the Glenburn member of the Alida beds. The inter-relationship of these stratigraphic horizons suggests an evolving architecture in the configuration of the Williston Basin.

The Glenburn reservoir is characterized by coated crinoidal and bioclastic grainstones with over 15 percent porosity and permeability from 100 to 5000 millidarcies. A second order hiatus occurred in the mid-Osagean (end of Glenburn time) with a concomitant drop in relative sea level. This low stand event led to the erosion and incision of the Glenburn (Alida) surface. Deposition of thick sequences of Kisbey sand infilled narrow valleys which were scoured into the Alida surface. The Kisbey sand, which is the principal reservoir in the Kisbey Field, exhibits porosities up to 25 percent and permeabilities from 40 to 800 millidarcies. The Mohall member of the Frobisher beds develops into an important reservoir in local portions of the Kisbey Field. These Mohall peloidal grainstones and packstones have porosities of 15 percent and permeabilities up to 300 millidarcies.

Structural tilting of the basin after Mississippian Big Snowy Group deposition produced a series of low dipping cuestas and valleys in the exposed Madison Group. A cuesta landscape often develops along the flanks of a subsiding basin as the tilted strata are carved into escarpment trends that are a function of the weathering nature of the strata and the drainage pattern of the tilted basin. A significant cuesta escarpment in the Mississippian erosional surface developed updip of the Kisbey Field. This deeply incised strike-oriented escarpment fundamentally governs the extent of the trapping mechanism for the Kisbey Field. These cuesta ridges and valleys were eventually covered with the deposition of Triassic to Jurassic-aged Red Beds.

The reservoir characteristics of the Glenburn, Kisbey and Mohall cycles are, in large part, related to the original depositional processes. These original pore networks have been modified by later diagenetic events. These processes have created heterogeneous and compartmentalized reservoirs that suggest further exploitation opportunity exists within the Kisbey Field.