The Bakken Oil Play of Southeast Saskatchewan: Stratigraphy, Facies Analysis and Sedimentology

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Abstract

In the past three years, southeast Saskatchewan has seen unprecedented land sale and drilling activity associated with the Upper Devonian-Lower Mississippian Bakken Formation oil play. The combination of high oil prices, technological advances, and a welcoming regulatory regime in the province has resulted in a “Bakken Boom” throughout the area.

The Bakken Formation comprises an upper and lower marine shale, bounding a middle siltstone/sandstone unit. All Bakken oil production in southeast Saskatchewan is from this middle unit. The Middle Bakken is further subdivided into three sub units informally termed A, B, and C. The lowermost unit A represents a dolomitic siltstone to very fine sandstone deposited in a distal ramp setting as part of a highstand systems tract. This was later eroded and reworked during a falling stage systems tract and overlain by Unit B. Unit B is a calcareous fine to medium sandstone representing a lowstand deposited in a more proximal setting. This was then overlain by bioturbated laminated siltstones of Unit C during a subsequent transgression.

Oil has migrated northwards from thermally mature Upper and Lower Bakken source rocks in North Dakota. It has been trapped within the Unit A below the regressive surface of marine erosion created during the relative sea level fall of the falling stage systems tract and the subsequent Unit B and Unit C. It is also trapped updip stratigraphically to the north-east by lower quality Unit A strata.

The Unit A reservoir is characterized by porosity ranging from 10-15% and very low permeability (<1mD). As a result, complex multi-stage fracturing of horizontal wells is required to achieve production. The produced oil is of high quality often nearing 40°API.

This presentation will examine the sedimentology and facies architecture of the Middle Bakken and how they relate to hydrocarbon trapping and production.