

The Integration of Geological and Technological Aspects and Their Influence on Production in the Bakken Play, Williston Basin

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Abstract

A great variety of factors can influence production, and it is often difficult to discriminate how significant the impact of a single factor is. The unconventional nature of the Late Devonian to Early Mississippian Bakken tight-oil play requires considering both geological and technological aspects, as completion designs evolved at a rapid pace over recent years. Based on an integrated and correlative approach this study aims to understand why certain areas in the Bakken play are considerably more productive than others, and to identify the responsible factors.

The Bakken is a technology-driven play and a clear trend of increasing production rates over time is evident as drilling techniques and the completion design of wells are progressively becoming more sophisticated. However, geological conditions seem to outweigh technological improvements, in particular in sweetspot locations.

Geological factors influencing productivity can reach from reservoir quality and thickness, over structural and stratigraphic framework, rock-mechanical properties, natural fractures, to pore-overpressure distribution and organic geochemical parameters. The interplay of hydrocarbon generation potential and maturity results in tremendous overpressuring, and creation of fracture permeability and secondary porosity. Redistribution of hydrocarbons by migration into up-dip located traps can result in large-scale accumulations, as for example Sanish-Parshall and Elm Coulee.

The understanding of where and why sweetspot and low productivity areas occur is invaluable for both current development and future exploration.

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