Kaybob Dunvegan Oil: A Not-So Unconventional Oil Play

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Abstract

Industry has become focused on “tight” or “unconventional oil resources”. Significant recent activity includes horizontal oil completions in conventional tighter marine sandstones such as the Cardium, Viking and Montney formations. These reservoirs comprise mappable sandstone targets, albeit with lesser permeability than discoveries made twenty years ago. The Kaybob Cretaceous Dunvegan oil play has very similar reservoir characteristics and more than 95 Dunvegan horizontals have been drilled in the last three years resulting in significant light oil production.

The Dunvegan formation was exploited as a gas- and oil-bearing fluvial/deltaic play for several decades. The first horizontals were drilled in thick fluvial channels in the mid-1990s in the Latornell/Ante Creek/Simonette areas of Alberta. Recent oil production is occurring in more marine settings. The formation has been extensively studied and documented by many authors (e.g. Bhattacharya et al 1991, Plint 2000). Several clinoforming units or shingles (G-E) are interpreted to prograde to the east into coastal areas. In particular, the delta associated with the Dunvegan E unit at Kaybob incised far into the marine environment, so that it was subjected to the reworking process of waves and tides.

Core and cuttings work contributed greatly to confidence of the interpretation of wave and tide reworked shorefaces. Detailed core work revealed good examples of shorefaces overlying slumped delta front sandstones as well as tidal bundles associated with the tidal currents. Core to log calibration showed that gamma log signatures could be unreliable for facies identification. Detailed examination of cuttings from over 100 wells helped distinguish marine environments and remnant poor quality fluvially -dominated rock. Successful horizontal drilling has been the result of good hand drawn geological maps and steering control to optimize production. A significant contribution to the success of the drilling program was the recognition that the deltaic sandstones were reworked into north-south trending marine shorefaces, enhancing both reservoir qualities and lateral continuity. Horizontal wells generally perform better when drilled perpendicular to depositional strike.

Completion test results indicate that the reservoirs are homogeneous given very consistent fracture initiation pressures. Decline curves flatten strongly after a few months flush production, supporting the interpretation of tighter but conventional marine sandstone reservoirs. Additional recovery is expected from the application of slickwater fractures, greater well densities in tighter rock and waterflood schemes in more porous rock. Multi-stage completion techniques have had a significant impact on the economics of producing oil from these tighter conventional oil reservoirs of the Dunvegan formation.

References Cited

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