Recovering Bitumen from a Carbonate - The Saleski Pilot

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Abstract

Over three years of production from the Saleski Pilot have demonstrated the importance of considering pore structure in facies definitions.

In December 2010, following a hiatus of approximately 25 years, a joint venture between Laricina Energy Ltd. and Osum Oil Sands Ltd. established a Grosmont steam injection pilot in the Saleski field. The Grosmont Formation is an Upper Devonian ramp carbonate that was deposited on the northeast edge of the Woodbend basin within which Alberta's prolific Leduc reefs developed. Of the estimated 1.8 trillion barrels of bitumen resource in Alberta, Canada, approximately 30% are located in carbonate rocks, with 400 billion barrels in the Grosmont Formation (ERCB, 2011).

At Saleski, lower bitumen bearing unit, the Grosmont C, is a highly fractured vuggular dolomite with 16-20m of pay and 14-20% porosity. The overlying Grosmont D has 30m of bitumen pay and the principal reservoir type is a dolomite breccia with 22-40% porosity. The two units are separated by a thin shale unit called the CD Marl. Porosity development in both units is largely attributed to an intense episode of karsting in the early Cretaceous that produced three pore systems: matrix, vugs and fractures.

The Saleski Pilot has produced over 300,000 bbl bitumen to date by operating four horizontal well pairs through a process similar to SAGD, as wells as operating 4 horizontal wells in a cyclic manner. Two wells completed in the Grosmont C Formation demonstrated economically attractive performance with cycle steam-oil ratios between 3.5 and 3.9, and calendar day oil rates in excess of 300 bopd.

The wells are completed in a interval with large vugs, a nominal total porosity of 14% and an oil saturation of 65%. The performance of the wells exceeds expectations based on the low bitumen concentration. This demonstrates that concepts developed for clastic oil sand reservoirs cannot be applied to fractured carbonate reservoirs, and that the pore space geometry of matrix, vugs and fractures has a significant impact on well performance.

This paper discusses how pore space structure is considered in the definition of facies, used as input for reservoir simulations.