

Duvernay Shale – An Unconventional Reservoir

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Summary

The Devonian Duvernay Shale is the offshore equivalent and source rock to the prolific oil and gas producing Leduc and Nisku Formations.

Introduction

Since December, 2009, substantial money has been spent on land sale activity for rights for the Duvernay. Over \$2 billion has been spent in these sales in western Alberta. Since the first well was drilled in the summer of 2009, over 20 wells have been drilled or are drilling for the Duvernay shale. The two main areas are in the Pembina and Kaybob Areas. Many wells that have been drilled have tested the Duvernay with initial rates of up to 8 Mmcf/d and 75-100 barrels/Mmcf.

Results

This core display covers the Celtic Kaybob S 13-25-59-19W5 well. This well was drilled to a TD of 3280 m in September 2010 and 45.4 m of core was cut from the Duvernay. The Duvernay consist of massive to laminated, organic-rich, calcareous shale, with a few minor skeletal-rich beds. Deposition is interpreted to have occurred in a deep basinal setting under dysoxic to anoxic conditions. Kerogen is high and is preserved because there is limited oxygen and a lack of grazing organisms.

There is abundant detrital quartz and calcite silt sized grains, and minor feldspar and dolomite grains. Many of the calcite grains are bioclastic grains. The intergranular porosity is filled with organic material, clays, and carbonate and silica cement. This mineralogy including these cements result in a brittle rock, suitable for fracturing and producing substantial quantities of gas. Fluid sensitivity tests have been run and suggest that the Duvernay is not sensitive to any type of frac fluid. This suggests that simple fracs can be used to complete these wells.

The Duvernay is an organic-rich shale with up to 7.2% TOC (averaging 3.8% TOC). The rock is a mature source rock (in the condensate-rich gas zone) with an average $R_o = 1.11$. This shale has good porosity and permeability. Porosity is up to 10.6% (averaging 7.5%) and absolute permeability up to $1.86E-02$ mD.

From these initial tests, the Duvernay is overpressured. The amount of overpressuring has not been quantified yet.

Conclusions

From log analysis, it is estimated that there is 120 BCF/sec free gas and 14 BCF/sec absorbed gas for a total of 134 BCF/sec gas in place.

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