Shale Gas Petrophysics – Montney and Muskwa, Are They Barnett Look-Alikes?

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Abstract

Shale gas reservoirs have rapidly become the focus of exploration and production throughout the Continental USA and Canada. These shale gas reservoirs invariably have two factors in common, namely, the need for quality petrophysical work and the implementation of innovative drilling and completion technology. In the past 5 years the Barnett shale has become the benchmark for both petrophysical and completion technology work, a huge success story for the United States. With this, there has almost been a requirement to compare “your” shale with the Barnett shale, to provide a comfort level for both management and non industry financiers.

This work compares two shales of very different character. They are both in British Columbia, Canada and are themselves the focus of exponential growth, associated land prices having increased 10 fold in 2008 alone. In addition, they have both at one time, been cited by industry commentators as Barnett look-alikes.

Net pay mapping of the shales is key to purchasing the best land and drilling the best wells. First and foremost, it is important to understand the geological environment of deposition of each of the shales. We demonstrate that the depositional setting for the Montney and Muskwa shales is very different, giving rise to equally different rocks. Both are fundamentally deep basinal environment, however the Montney has well sorted sediment influx in the form of submarine flows or turbidites. Once this is understood, the rock work, including thin sections, XRD, SEM and core analysis (TOC, porosity, permeability, Dean-Stark saturation and grain density) can be effectively integrated into the petrophysical evaluation and more reliable net pay maps can be produced.

This paper illustrates the predictive capability of a well calibrated wireline log in estimating petrofacies, porosity, and TOC. Net pay, porosity and TOC maps are presented in the paper. Further, we show that although both are prolific gas producing formations, only one, the Muskwa, can truly be called a Barnett look alike. The Montney can be termed a hybrid shale, comprising thinly laminated shale, organic material and siltstone. The Montney has much lower TOC than the Muskwa, 1 to 3 percent compared to 5 to 10 percent, but has intrinsically higher permeability than the Muskwa because of its coarser, more granular siliciclastic composition. In this regard, the Muskwa is similar to the Barnett shale. An understanding of the rock fabric and the differing petrophysical properties of the two shales leads to different completion strategies for optimum gas production.

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