Reservoir Facies and Characteristics of the Montney Formation Resource Play in the Western Canada Sedimentary Basin

Thomas F. Moslow[1], Matthew G. Adams[2], Alessandro Terzuoli[3], and Beth Haverslew[4]

[1]Moslow Geoscience Consulting Ltd., Calgary, AB, Canada.
[2]Progress Energy Canada, Calgary, AB, Canada.
[3]AT Geoscience Consulting, Calgary, AB, Canada.
[4]Altamin Resources, Calgary, AB, Canada.

ABSTRACT

Analysis of 2500m of full-diameter core from wells in the Lower Triassic Montney formation, northeastern British Columbia have identified three principal unconventional reservoir facies associations. Their excellent hydrocarbon deliverability makes the origin, lateral variability and heterogeneity of these reservoir units an issue of economic significance within a leading North American resource play. Two of the three reservoir units are bioclastic in origin deposited on a prograding southwest-dipping ramp. The oldest is a Dienerian monospecific, life assemblage of Claraia sp. “flat clams”, interpreted as a biostrome, interbedded with highly bituminous, parallel laminated siltstones deposited out of suspension near storm- weather wave base. The unit grades basinward into hemipelagic dolosiltstones and paleolandward into lower shoreface siltstones/sandstones. The younger bioclastic unit is a Smithian mixed carbonate/clastic ramp facies association. Bioclastic beds are sharp based, normally graded and comprised of an admixture of pelecypods, brachiopods and echinoderms interpreted as tempestites. There are 3 parasequences within this reservoir interval, each grades basinward into bituminous siltstones and hemipelagic dolosiltstone. Bioclastic beds are densely calcite cemented with minimal measurable porosity (1-2%). Interbeds of siltstone in both successions are highly bituminous (TOC 2-4%) and of relatively high total porosity averaging 5-6%. Hydrocarbon deliverability is a function of geomechanical rock properties attributable to high frequency interbedding of brittle/ductile facies resulting in significant permeability and geomechanical anisotropy leading to more effective reservoir stimulation through hydraulic fracturing. The third reservoir facies is a Spathian siliciclastic prograding shoreface facies association with fabric selective control on reservoir quality, pore throat size distribution and permeability anisotropy. Variability in sedimentary fabric is linked directly to sedimentary facies. Mercury injection porosimetry plots display distinctive distributions of pore throat apertures which are directly related to grain size distribution, physical and biogenic sedimentary structures (i.e. cyptobioturbation) and diagenesis. As such, a predictive framework has been derived for the distribution of better/best reservoir quality facies that are mapable through calibration of facies to well log response and character.