

Barons Sandstone – A Potential Emerging Light Tight Oil Play, SW Alberta

Per K. Pedersen¹ and Rob W. Vessey¹

¹Department of Geoscience, University of Calgary, Calgary, AB, Canada (pkpeders@ucalgary.ca, rwvessey@gmail.com)

Abstract

Muddy sandstones of the Baron member of the early Cenomanian Fish Scales Formation is a potential emerging light tight oil play in SW Alberta. Numerous multistage fractured horizontal wells have been drilled into the play the last years with highly varying success. This highlight the importance of developing a better understanding of the sedimentology, mineralogy, stratigraphy and reservoir properties of the play to locate potential fairways within this pervasive oil charged succession.

The Fish Scales Formation is comprised of several units which in turn have a highly variable content of very fine to coarse grained sand, conglomerates, fish bones, pyrite, organic content and bentonite beds. Sandy units that occur at multiple stratigraphic levels are referred to as the Baron member. The highly variable composition of the Fish Scale Formation complicates petrophysical evaluations of the play, especially porosity, water saturation and shale volume computations. Compared with more rich intervals, sandy intervals are in places characterised by higher gamma ray readings and high density readings due to an increase in content of pyrite and fish bones associated with the increase sand content.

Isolated sandstone and conglomerate bodies of the Baron member with conventional reservoir properties form several oil and gas pools in SW Alberta. The Penny Baron Pool spanning Townships 7 to 9 and Ranges 21 to 24 west of 4th meridian is one of such pool. The conventional type light oil pool consist of a 1.5km wide, 20km long northwest-southeast trending reservoir comprised of coarsening upward shoreline sandstone reservoir with estimated OOIP of 27827.07 MBbl and OGIP of 12.56 Bcf. The reservoir is comprised of fine to coarse grained sandstone ripples, often draped by organic rich black mudstones, which are interpreted as deposited on the landward side of a barrier island or spit that retrograded to the southwest. A general lack of hummocky cross stratification and low ichnofauna diversity is corroborate deposition in a highly bimodal energy shallow water depositional setting characterized by dysoxic bottom water conditions. Thin bedded washover sandstone beds encased in mudstones located on the landward side of the barrier island comprise a potential halo-type tight oil play along the southwestern margin of the Penny Pool. These 1-4cm thick thin, very fine grained sandstone beds are a relative tight with 3.0-6.0% porosity and permeability ranging from 0.09-0.18 mD. In addition, the sandstones are likely characterized by poor connectivity due to their lenticular character and encasement in mudstones. Completions of this facies in vertical wells have not been able to achieve economic flow rates. However, as the Viking tight oil play in SW Saskatchewan has demonstrated hydrological fractured horizontal wells might be able to increase the connectivity of these isolated sandstone beds to provide more effective drainage, and thereby economic flow rates and recoveries. Facies similar to these along the southwestern margin of the Penny Pool occur in numerous areas in SW Alberta, highlighting the potential large scope of this tight oil play.