Prospecting for Viking Oil Resources: Verendrye to Forgan Trend

Leah Wilson (1), Rick Wierzbicki (2), Len Stevens (2)

1. *Mount Royal University*
2. *PrairieSky Royalty Limited*

Summary

The Viking reservoir in SW Saskatchewan is one of the most cost effective and active light oil plays in the Western Canadian Sedimentary Basin. Horizontal drilling and multi-stage hydraulic fracture stimulation techniques have revitalized this widespread low permeability sandstone reservoir which was first discovered and developed over a half century ago.

The Viking sands were deposited as sanding up cycles separated by marine mudstones in the Western Interior seaway in Upper Albian time. The tops of cycles are interpreted as erosional surfaces. The Viking reservoir consists of discrete fine grained sands and occasionally granular to pebbly conglomerates, interbedded fine grained sands and shales, and bioturbated sands and shales (White and Velesco, 1970; Pozzobon and Walker 1990). The depositional environment is proposed to be a combination of offshore bars, lowstand shoreface and foreslope sands, deltaic sediments, and submarine flows (Mathison 2013; Michaud 2015).

The early development of the pools with vertical wells focused upon the more continuous sand layers and the conglomeratic bodies. Current horizontal drilling technology can also recover hydrocarbons from the thin interbedded and bioturbated facies as well as the unswept portions of the better quality sands.

This paper is an overview of the reservoir trend in the area of the Verendrye, Plato, Totnes, Elrose and Forgan pools. The work is the result of a summer student project and was done using readily available well log, drill stem test, and production data with a small amount of core review. It was an effort to gain an understanding of reservoir distribution, hydrocarbon charge, and the location of remaining economically recoverable reserves

The challenge with this project was working with log suites which cannot be expected to accurately represent the thin bedded and shaly nature of the reservoir. A combination of petrophysical cutoffs integrated with DST and production data was used to overcome this challenge and identify the best areas of the stacked reservoir intervals. An effort was made to subdivide the Viking sands but without detailed core study this stratigraphic subdivision was of limited reliability. Instead the stacked sum of reservoir properties of interest were used to identify prospective fairways for additional exploration and development.

The most important observations were that it appears that oil is trapped in local structural lows and in the lower quality reservoir sands while gas is trapped on structural highs in the better quality sands which match observations of others (Kohlruss 2015). Some of the results of recent horizontal drilling would suggest that situations occur where the higher quality sands are gas prone while the adjacent interbedded

sands and shales surrounding them are oil bearing. Wells drilled in this intermixed resource play and conventional reservoir zone perform like oil wells despite having a free gas component (often depleted from earlier production).

Acknowledgements

Thank you to PrairieSky Royalty for permission to present this work.

References

1) Kohlruss Dan: Structural Influences on Hydrocarbon Accumulation in the Viking Formation, West Central Saskatchewan: in Summary of Investigations 2015, Volume 1, Saskatchewan Geological Survey, 2015

2) Mathison Ed: Stratigraphy and Facies of the Dodsland Viking Tight oil Reservoir, Twenty-first Williston Basin Petroleum Conference: Core Workshop Volume, 2013

3) Michaud Kain J.: The Origin and Extent of Coarse Grained Sandstones in the Viking Formation near Dodsland, Saskatchewan, Search and Discovery Article #51056, 2015

4) Pozzobon Joseph G. and Walker Roger G.: Viking Formation (Albian) at Eureka, Saskatchewan: a Transgressed and Degraded Shelf Sand Ridge, The American Association of Petroleum Geologist Bulletin, Vol. 74, Number 8, 1990

5) White W. I. and Velasco F. B.: Viking Formation of the Hoosier-Dodsland Area, Saskatchewan Geological Survey, 2010-Mesozoic Core Seminar, 1970