

Differentiation of Productive Zones in the Milk River Using Multi-Frequency Gradient Magnetic Field Side Looking NMR

James Lee*

Western Gas Resources Canada Company, Calgary, Alberta, Canada
jlee@westerngas.com

and

Stephen Ahloy, Glen Horel and Andy Shaw
Baker Atlas, Calgary, Alberta, Canada

Abstract

Western Gas Resources Canada Company (WGRCC) is one of several companies currently developing the Milk River Formation in the Vidora strike area of southwestern Saskatchewan. At this time, there are approximately 77 wells producing gas from the fine grained, argillaceous sandstones of the Milk River. Gas production rates can vary greatly, with initial production ranging from ~10 mcf/d to over 1000 mcf/d. All of the subject producing Milk River wells also co-produce water, with rates ranging from <10 bbl/d to >100 bbl/d. Due to the economic impact of water handling and disposal, WGRCC has been working to optimize the completions hydraulic fracturing design in order to maximize the volume of gas produced and minimize the volume of water.

Traditional log analysis has proved to be of little use in determining wet vs. gas zones in these low resistivity, low contrast rocks. Core and log analysis have determined that there are four main coarsening-upwards sequences in the Milk River that can be mapped throughout the area. Production logging has shown that gas and water production can vary from zone to zone within the Milk River and can vary dramatically from well to well.

To help determine gas and water zones, four of WGRCC's most recent wells were logged using a multi-frequency gradient magnetic field side looking NMR Formation Evaluation tool (MREX). WGRCC is currently working with the logging contractor to calibrate the MREX outputs, including the T1/T2 ratio to determine the zones within the Milk River that are more water-prone.

This joint effort between Baker Atlas and WGRCC will combine the data from the MREX and other geophysical logs to the core data and the actual completion and production information. By calibrating these initial MREX logs to the core and production data, it is hoped that the MREX can be used as a predictive tool on future wells to help avoid communicating with water-prone zones prior to completing them.