

## **Bakken Research Consortium, North Dakota; Unconventional Oil Reservoir Characteristics and Stimulation Analysis**

**Ernest Gomez and Alexander G. Perakis**

Schlumberger Data and Consulting Services, Greenwood, Village, CO 80111

The discovery and subsequent development of Elm Coulee Field, Richland County, Montana in 2000 led to the establishment of the Mississippian - Devonian Bakken Formation as a viable unconventional reservoir. Exploration and development activity migrated eastward from Montana into North Dakota, where, with the exception of the discovery of Parshall Field, initial results were mixed. It became apparent that reservoir heterogeneity was important, but the data necessary for a proper evaluation was not being acquired. To address this and to determine the Bakken production drivers, a joint research consortium of operators, service companies and academia was established in late 2007. The consortium "laboratory" was located in section 36 T156N R95W. Three (3) east - west 4000' laterals were drilled 1500' apart along with a vertical pilot well in this square mile area. A variety of measurements including open hole logs and core were acquired and integrated in 3-D. A key objective of the consortium was to examine the differences in geometry and stimulated volume between single stage (bullhead) and multi-stage hydraulicfracture treatments and to see if this behavior could be modeled. Using the acquired mechanical rock data, hydraulic fracture treatments were modeled in the northern (single stage) and southern laterals (6 stages). Microseismic was employed downhole in the middle lateral, near the surface and at the surface during execution of the hydraulic fracture treatments. The actual hydraulic fracture treatment behavior was very similar to the model predictions. The consortium results indicate that matrix, natural fractures and 3-D rock properties change rapidly in the Bakken. The measurement of these properties is important for modeling and optimizing completions. Operators have used many of the consortium results in recent years to expand the productive economic limits of the Bakken.