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Oil & Natural Gas Projects

Exploration and Production Technologies

Subtask 1.2 – Evaluation of Key Factors Affecting Successful Oil Production in the Bakken Formation, North Dakota

DE-FC26-08NT43291 – 01.2

Goal

The goal of this project is to quantitatively describe and understand the Bakken Formation in the Williston Basin by collecting and analyzing a wide range of parameters, including seismic and geochemical data, that impact well productivity/oil recovery.

Performer

Energy & Environmental Research Center, Grand Forks, ND 58202-9018

Background

The Bakken Formation is rapidly emerging as an important source of oil in the Williston Basin. The formation typically consists of three members, with the upper and lower members being shales and the middle member being dolomitic siltstone and sandstone. Total organic carbon (TOC) within the shales may be as high as 40%, with estimates of total hydrocarbon generation across the entire Bakken Formation ranging from 200 to 400 billion barrels. While the formation is productive in numerous reservoirs throughout Montana and North Dakota, with the Elm Coulee Field in Montana and the Parshall area in North Dakota being the most prolific examples of Bakken success, many Bakken wells have yielded disappointing results. While variable productivity within a play is nothing unusual to the petroleum industry, the Bakken play is noteworthy because of the wide variety of approaches and technologies that have been applied with apparently inconsistent and all too often underachieving results. This project will implement a robust, systematic, scientific, and engineering research effort to overcome these challenges and unlocking the vast resource potential of the Bakken Formation in the Williston Basin.

It is anticipated that this project will be coordinated with complementary, but separate, ongoing research efforts being conducted by the following:

- Colorado School of Mines, DE-FC26-08NT0005672 (Golden, Colorado)—In this study, the Colorado School of Mines will conduct an initial assessment of the hydrocarbon potential of the Bakken Shale in the Williston Basin and develop an integrated reservoir geomodel for this important formation. An improved understanding of Bakken Shale producibility is expected to reduce drilling risk and provide more accurate resource estimates so that operators can significantly improve recovery by optimizing drilling and completion strategies.
- University of North Dakota, [DE-FC26-08NT0005643](#) (Grand Forks, North Dakota)—In this project, researchers will measure geomechanical properties and determine in situ stresses within the Bakken Formation in the North Dakota Williston Basin in order to provide basic data needed to improve the success rate of horizontal drilling and hydraulic fracturing operations in this region.

Potential Impacts

The results of this study will provide a clearer understanding of how to efficiently maximize the exploitation of the vast Bakken resources in the Williston Basin. A detailed comparison of the predictive utility of various collected data sets within different geological settings of the overall Bakken play will be compiled to provide operators and stakeholders with fresh insight regarding the roles that geologic structure and geomechanics play in the design and operation of a successful Bakken well in North Dakota.

Accomplishments

This project was started on 10/1/2008. No technical accomplishments have been recorded to date.

Current Status

This project was started on 10/1/2008. This is a project with 4 tasks to analyze and describe a wide range of well data parameters in the Bakken.

The project is currently on Task 1 which includes the collecting and analyzing of well file data from the Risk-Based Data Management System (RBDMS), used by the North Dakota Department of Mineral Resources (NDDMR) to enter, process, and archive well data. The RBDMS (and/or other databases/records) will be used to analyze a wide range of parameters that impact well productivity/oil recovery from the Bakken. Currently, many key parameters of interest are not gathered and managed as part of the NDDMR RBDMS. Data parameters such as proximity to structure, number and azimuth of induced fractures, nature and distribution of sand, and other geological and geomechanical data will be evaluated at the NDDMR headquarters in Bismarck, North Dakota, through significant personal interaction with operators.

Data will be evaluated from two "type" areas of Bakken exploration and production within North Dakota. Data from an area which has seen many sustainable, highly productive new Bakken wells, will be compared and contrasted to data from another area of the state in which success rates and production have been less prolific. The data from the two areas will be compiled into a geographic information system (GIS) database that will support efficient interpretation of the data, enabling users to make comparisons between wells and/or areas of interest in a more effective manner.

Project Start: October 1, 2008

Project End: March 31, 2010

DOE Contribution: \$496,340

Performer Contribution: \$0

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