Data Integration is Key to Solving the Shale Gas Reservoir

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Summary

Shale gas development has been expanding at a rapid pace in many basins around North America and has garnered considerable interest in mature markets around the world. Success in the shale gas plays require seamless integration, analysis, and visualization of many types of data to reduce completion risk and maximize reservoir return thus leading to a more profitable project.

Linking field development with operations provides a powerful approach to improving reserve management - using a model-centric approach that includes a standardized methodology and knowledge capture to improve decision making and risk management - to exploit shale gas reservoirs using fractured horizontal wells. Further, direct integration with real-time data to monitor and adapt and fracturing process while completing is critical to successful production of these reserves.

Introduction

Shale gas plays are the most rapidly expanding trend in onshore domestic production today. An exert from the "*Oil and Gas Journal* (OGJ) reports that Canada had 57.9 trillion cubic feet (Tcf) of proven natural gas reserves in January 2009. The country produced 6.6 Tcf of natural gas in 2007, while consuming 3.3 Tcf. Canada is the second largest producer of natural gas in the Western Hemisphere, after the United States. Like the oil industry, Canada's natural gas production is concentrated in the WCSB, particularly in Alberta. Even though there have been some new conventional natural gas finds in the WCSB, many analysts predict that conventional natural gas production in the WCSB has reached its zenith. Future natural gas production will likely center on coal bed methane (CBM) and shale gas deposits in the WCSB, Arctic frontier natural gas deposits, the Deep Basin area, and offshore natural gas fields."[1] The shale gas reservoirs are extremely tight and usually only produce through fracturing the formation. The gas is stored in the matrix and in the fractures and sweet spots vary with mineralogy. Having good measurements and good modeling tools is the key to developing these reservoirs.

Method

The shales in these types of plays behave very different from basin to basin and it's important to not take an approach that assumes that what techniques may have worked in one basin or even in an area of the basin may work in another basin or in another part of the same basin. The shales are behaving differently and it is critical to understand the facies and the stresses to efficiently complete these reservoirs. Without modeling this is impossible.

The first step to solving the shale gas reservoir is data collection and validation. It is critical to be able to load the data into a single common application for review and collaboration by the asset geoscientists. It is critical to have the appropriate detailed log measurements to determine rock properties and natural fracture detection. Rock stress measurements are also needed to assist with completion strategies.

The second step is building the reservoir model. This step allows the geoscientist to get a good handle on the distribution of the reservoir properties. Facies and petrophysical properties should be populated throughout the model and the lateral and vertical heterogeneity can be calculated to establish trends. Initial volumes can also be calculated at this step.

Lastly once the model is created it can then be investigated and simulated to identify the sweet spots, to calculate gas in place, and to determine production economics. Through simulation the extent of stimulated volumes can be calculated and thus the drainage area. Knowing the stimulated volume and drainage area, better decisions can be made on the well patterns and placement and the completion strategies. The geoscientist can start to make better decisions on completing these reservoirs more efficiently and move away from the "cookie cutter" approaches and move toward selective stimulation.

Conclusions

The integrated field development approach allows the geoscientist to use all the data together to make the best, most up to date decisions on their day to day reservoir activities and on their overall field development plans. Data integration and a model centric approach also enables knowledge capture for audit trails and repeatable workflows for decision making efficiencies. Key in these tightly regulated areas that are greatly impacted by environmental issues.

References

[1] U.S. Energy information Administration, http://www.eia.doe.gov/emeu/cabs/Canada/NaturalGas.html