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Petrophysical applications of LWD measurements in Duvernay Shale, Western Canada

Abdul Fareed & Raymond Nanan – Schlumberger Pathfinder
Dinara Khalmanova, David Llewellyn - Shell Canada.

Summary

The Duvernay formation in Western Canada has attracted significant attention of E&P companies due to its liquid rich properties as an unconventional Shale reservoir. Within recent times, Shell Canada has started acquiring Logging While Drilling (LWD) resistivity, density/porosity (triple combo) logs and density images along the horizontal section to fulfill their petrophysical needs. Initially, the data has been acquired as wash-down (memory) log to avoid pipe conveyed wireline measurements and then subsequently started in while drilling (Real-Time) mode. This mode has resulted in further improvement in the quality of logs and has reduced a significant amount of rig-time required initially for pipe conveyed wireline logging.

With the increased deployment of technology and newer and more advanced LWD techniques, petrophysical understanding of this emerging play in real-time will become better understood and further add efficiency to drilling and completion operations.

Introduction

The Duvernay shale play is one of the active unconventional shale reservoir where drilling activities are continuously increasing in Western Canadian Sedimentary Basin. Similar to other unconventional plays, Duvernay also exhibits geological heterogeneity along the horizontal wellbores. With the help of using new technology available in real-time, it is possible to evaluate the formation properties while drilling, help understand the drilling challenges, mitigate operational risks and complete the petrophysical analysis earlier in time.

Better understanding and improvement can be made by utilizing the available techniques and recent methods for unconventional reservoirs. LWD measurements can be proved to be useful in defining the reservoir quality and hence can further aid in improving completion quality, needed at the time of hydraulic fracturing, if suitable measurements are acquired along the horizontal section.

Theory and/or Method

GR-resistivity, Density/Neutron Porosity and Density image logs are routinely being acquired along the horizontal well section in Duvernay Shale formation. The tools required for these measurements are part of the Bottom Hole Drilling assembly (BHA). and the data necessary for performing basic log quality control and measurements required to perform petrophysical analysis are sent up hole in Real Time. Furthermore, these RT logs are also fed into the geological model to continuously monitor and understand drilling trajectory within the desired target window.

Conclusions

LWD data provides cost-effective method of gathering data along the horizontal wellbores. These data allow to characterize the geological variation along the laterals, can be used to optimize the completion strategy and explain the variability of productive zones in these wells.

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References

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