Leveraging Data Analytics to Understand Key Drivers Within the Montney

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Summary

This presentation applies a geostatistical workflow to understand key drivers of well productivity in the Montney Formation. This analysis will demonstrate the importance of utilizing "big data" for a more comprehensive understanding of the complex relationship between completion design and geological properties on a basin-scale.

Introduction

Low-permeability reservoirs, including the Haynesville, Utica and Montney, have become the focus of many major oil and gas producers. The Triassic Montney is Canada's largest oil- and gas-producing play due to its vast size, over 130,000 km^2, and multiple producing intervals, which combined are up to 300-meters thick. In 2016, the Montney's daily output of 5.2 Bcf/d accounted for 30% of Canada's gas production. In comparison, the Haynesville and Utica produced 5.8 and 3.6 Bcf/d, respectively. The Montney is overpressured, self-sourced and is productive across all fluid windows. The formation is a quartz-rich, siltstone-dominated, tight reservoir deposited in an arid environment along a passive margin slope setting (Davies,1997); it is found at depths of 1,200 to 3,000 meters.

Areas currently underdeveloped, relative to other areas in the play, present significant economic opportunity for operators. These areas include the newer fringe Montney developments in northeast British Columbia, north of Fort St. John, and southeast of Grande Prairie (Gold Creek) in Alberta. The Gold Creek development area has less than 100 horizontal wells primarily targeting the liquids-rich Middle Montney zone (1,200- to 1,800-meters deep). The North Montney fringe development is targeting a relatively shallow (~1,400 meters), overpressured Upper Montney zone, with the Middle and Lower Montney as additional targets. Liquids percentages in the Northern Fringe area are ~ 11%, lower than Gold Creek at 20%. For operators to maximize well results, the variability and driving factors in the Montney's fringe areas must be understood.

Theory and/or Method

This case study analyzes a multidisciplinary data set of geological and engineering data, including digital wireline logs, core and completion data, to determine the play's key drivers. The analysis incorporated data from 2,000 wells with digital logs to produce the geological model. In addition, completion and production data from ~10,000 wells were used to create type curves based on operator, year and region to account for changing geological attributes across the play. A regional stratigraphic and petrophysical model of the Montney was generated, dividing the play into three zones into which all horizontal wells were allocated. The multidisciplinary data set was then run through several multivariate regressions to determine the most influential factors in low-permeability conditions. Input variables for geological parameters included as thickness, porosity, lithology, TOC, well density, as well as completion parameters such as lateral length, proppant intensity, fluid intensity and well spacing. Statistically significant variables were then identified and used to predict potential uplifts associated with an enhanced completion design. This analysis focuses on the core Montney, where development is in full swing; the resulting variable relationships will be applied to currently underdeveloped fringe areas. This study will highlight the most important variables that affect future well optimization.

Conclusions

This study identifies what makes the Montney successful, focusing on potential uplifts associated with enhanced completions in the newer fringe developments, and it highlights the multidisciplinary analytical approach necessary to characterize accurately low-permeability rocks. The ideal geological and engineering parameters for each stratigraphic horizon targeted will be discussed.

Acknowledgements

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References

Davies, G.R., Aeolian Sedimentation and Bypass, Triassic of Western Canada. Bulletin of Canadian Petroleum Geology, Volume 45, p. 624-642, 1997.