



The Importance of Geoscience in using Machine Learning to Predict and Optimize Well Performance – Case Study from the Spirit River Formation

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Summary

This machine learning study incorporates geoscience and engineering data to characterize which geological, reservoir and completion data are the most important factors in achieving increased well performance. A better understanding of the key factors which can help predict well performance is useful in assessing commercial viability, optimization of capital spending leading to increased rates of return, exploration and development, and reserve and resource evaluations.

Machine learning is an unbiased analytical approach to interpret large datasets. Efforts to use machine learning in the oil and gas industry to predict well performance are often focused on engineering completion technology. As geological data is interpretive, often varying from one geologist to another, or from one pool to another, it is difficult to incorporate most geological data into a regional machine learning model. Machine learning models generally demand large databases of consistently evaluated data. This case study has utilized GLJ Petroleum Consultants regional geological Spirit River database^(A, B) as it has a consistent petrophysical evaluation methodology across the whole play. This geological database is complemented with the Frac Database, and public production data.

GLJ Petroleum Consultants has partnered with Verdazo Analytics in this initiative, marrying GLJ's databases and experience in the Spirit River along with Verdazo's machine learning expertise. Approximately one hundred features were included in the original machine learning dataset. Throughout the process, redundancies in the data were observed. The dataset was high-graded to approximately a dozen key features which provide predictive results similar to using a full-featured dataset. These dozen key features are a combination of geological, reservoir and completion data, suggesting an integrated approach of both geoscience and engineering data is vital in predicting well performance, and optimizing performance in future wells.

References

^(A) Hirschmiller, J. (2018, April). Understanding 'Gas Initially in Place' and Deliverability in the Spirit River. Blog. <https://www.gljpc.com/blog/understanding-gas-initially-place-and-deliverability-spirit-river>

^(B) Hirschmiller, J., Lemke, C. (2018, May 7). Estimating 'Gas Initially in Place' in the Spirit River Formation, and Relationships to Production and Economics – From Brazeau to Wapiti, Alberta. Presentation and poster at the 2018 CSPG Geoconvention, Calgary, AB.