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A New Method for Production Forecasting: Predictive Analytics Vs Conventional Methods in The Montney

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Summary

One area where digital technology presents an advantage is in generating type curves and forecasting well production. Traditional methods are based on empirical equations formulated in the 1940s that have no physical rationale. Currently, engineers and analysts use a mix of these modified methods as well as "area expertise" in their technical assessments. This introduces a level of bias which makes it very difficult, if not impossible, for two independently generated forecasts for a given well to be meaningfully reconciled against one another. The original Arps equations were derived empirically through observations. One area where computers are far superior to humans is in pattern recognition. Machines can process copious volumes of data to empirically diagnose cancer better than doctors (90% vs 50%). Can a computer also predict well production more accurately?

Theory / Method / Workflow

In this paper, we will explore a revolutionary data-driven physio-statistical method of deriving production forecasts. The predictive analytical model underpinning this method has been trained on 200,000 conventional and unconventional wells in various basins with varying geologies, completion types, vintage, and operational conditions. Based on its use of experience and solutions to differential equations to ensure that the 1 million forecast samples that it generates for a given well always honour the fundamental physics of fluid flow, the method provides accurate, unbiased, repeatable, and validated results with a calibrated uncertainty.

Results, Observations, Conclusions

We test the accuracy of these forecasts generated in October 2017 against the following year of actual production data on a sample of 19 Montney wells that were also forecast by a genuine HRE (human reservoir engineer). The model predicted more accurately more than 50% of the time. The HRE tended to over-estimate the EUR of the wells by an average of 30% whereas the model on average under-estimated production by only 5%. While the HRE was better at predicting wells with less than 3 months of production, the model was better at predicting wells with high variances in production month-on-month.

Acknowledgements

This new method provides thousands of unbiased forecasts at one's fingertips as opposed to the labour intensive method of conventional production forecasting. This technology is truly disruptive in that it changes the role of a reservoir engineer, and time spent on this tedious task. This predictive tool is one way to propel an organization and an industry up the Gartner Analytic Continuum into prescriptive analytics and more sustainable resource development.