



Gas Field Development Challenges and Current Best Practices to Maximise Value

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Application of Machine Learning to Predict the Time Evolution of Condensate to Gas Ratio (CGR) for Planning and Management of Gas – Condensate Fields

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Motivation

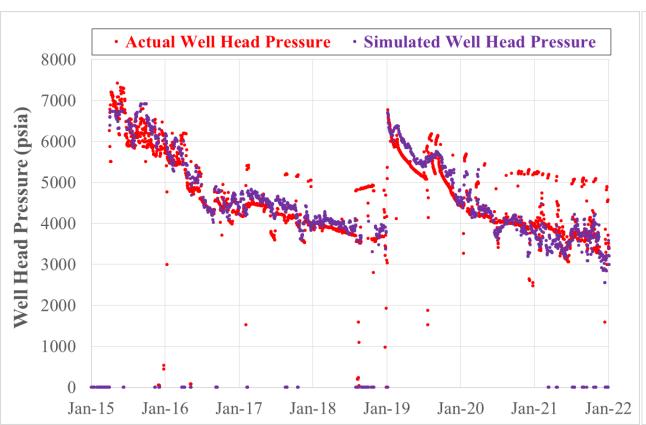
- CGR vs. Time: One of the most important parameters for the evaluation, forecast, and management of gas-condensate fields
- Traditional approach
 - > Lab experiments on gas and condensate samples: At the beginning and periodically after
 - o Time and effort
 - o Costs
 - ➤ Dynamic models
 - Could include many uncertainties
- Application of machine learning to predict the evolution of CGR vs. Time could be a new and effective approach to supplement conventional methods

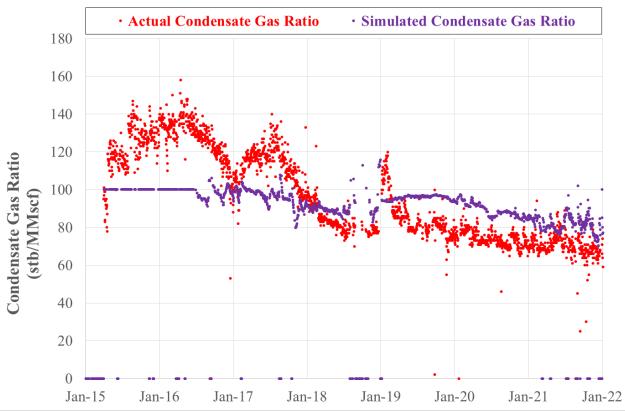




Introduction

- History Matching (HM) between actual and simulated values for Wellhead Pressure (WHP) is acceptable, but HM for CGR is very difficult
- ❖ Need an alternative method









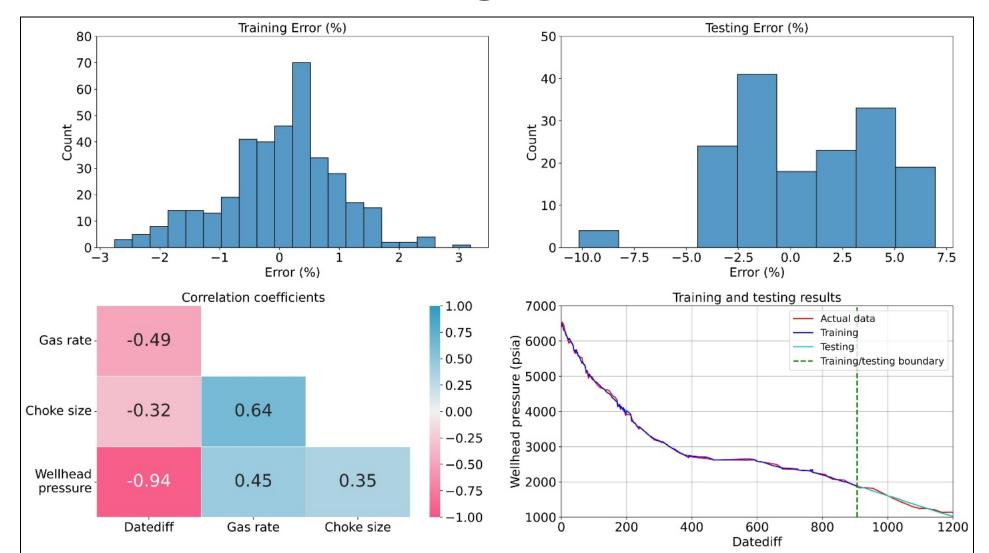
Methodology

Data preparation for HT-X Data preparation for HT-Y (depleted well) (producing well) Check history matching of wellhead pressure of HT-X Try different algorithms to History match wellhead using method by Ngo et al. pressure of HT-Y using history match CGR method by Ngo et al. 2023 of HT-Y 2023 Try different algorithms to Determine optimum Forecast wellhead pressure algorithm to history match history match CGR for HT-Y CGR of HT-Y of HT-X Determine optimum algorithm to history match Forecast CGR for HT-Y CGR of HT-X





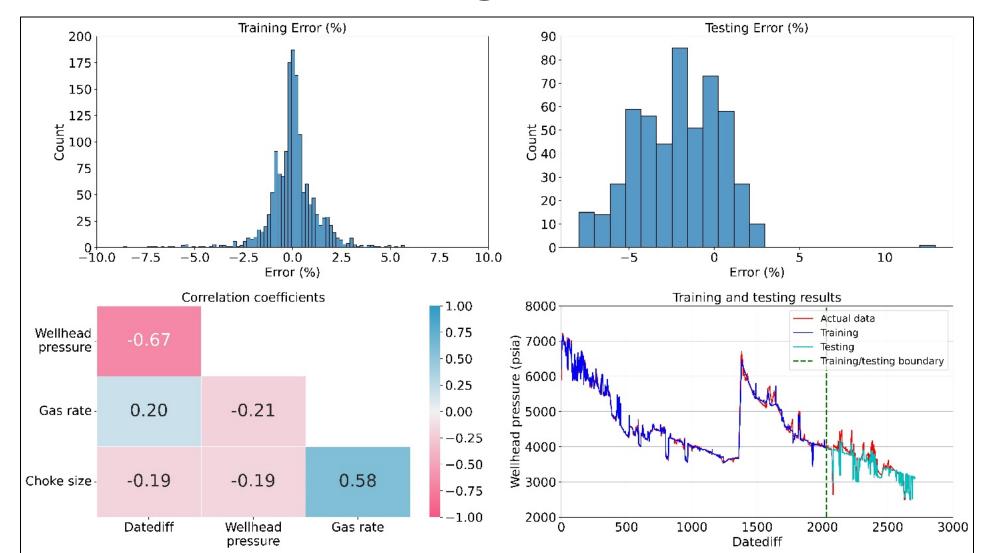
Results – Machine Learning Model for HT-X WHP







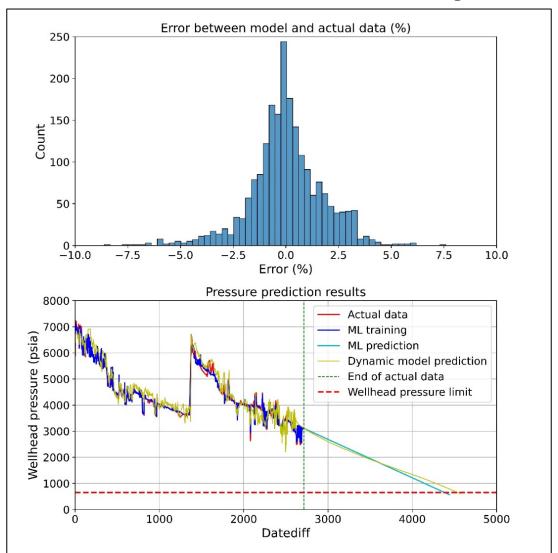
Results – Machine Learning Model for HT-Y WHP







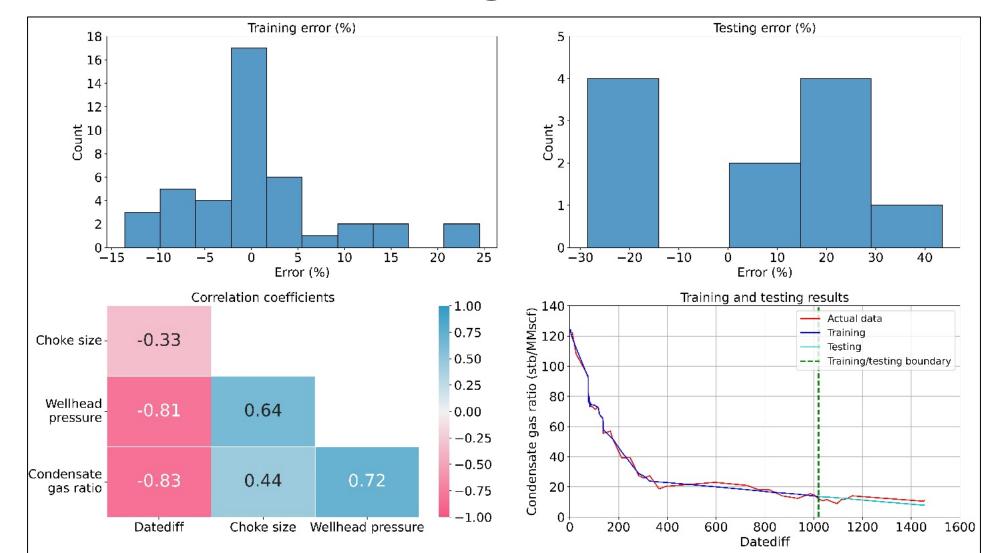
Results – HT-Y WHP Prediction vs. Dynamic Model







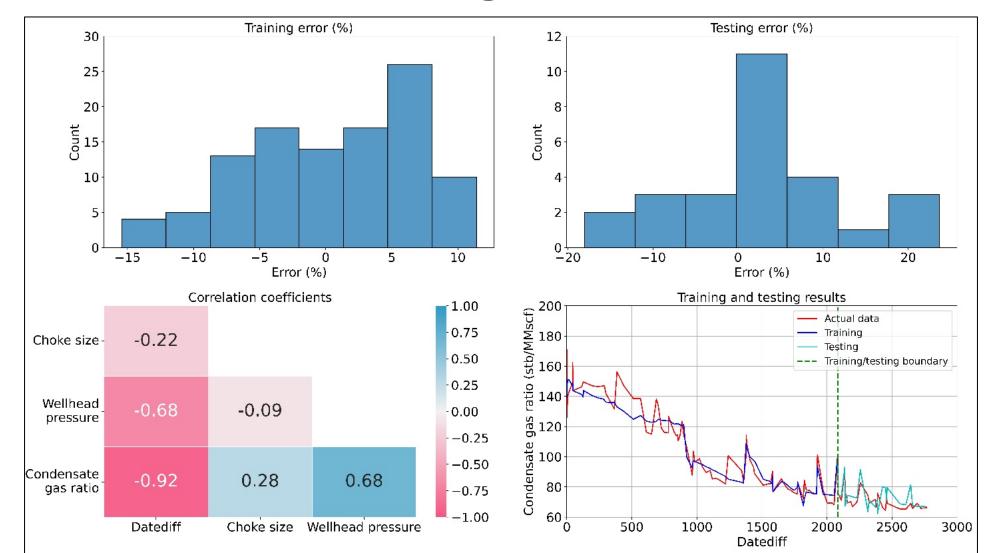
Results – Machine Learning Model for HT-X CGR







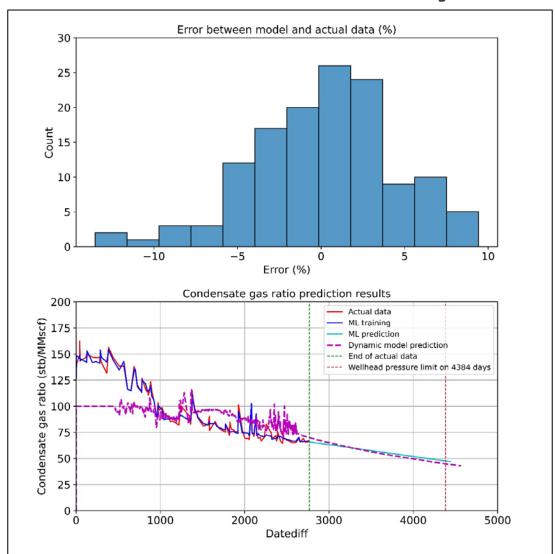
Results – Machine Learning Model for HT-Y CGR







Results – HT-Y CGR Prediction vs. Dynamic Model







Conclusions

- Machine learning was applied successfully to predict CGR vs. Time
 - ➤One of the most important parameters for gas-condensate reservoirs
 - ➤ But very challenging to forecast using traditional methods
- Provides significant support to the prediction of condensate production
- Help to better optimize production management of gas condensate fields