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Please fill in your manuscript title.	Automating Dynamic Simulation for Slug Detection & Advisor for Proactive Operation Mitigation

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Abstract

Benchamas is one of the assets where Chevron Thailand E&P has been experiencing various flow-assurance challenges, especially severe slugging. The engineering team has been facing challenges with a repetitive manual workflow of gathering production data to perform prediction and analysis. An innovative automated solution was developed to enable a more efficient workflow for faster slugging detection and mitigation, and to optimize operation uptime for the operation.

Open-source Python programming is used to automate workflows, including automating the integration of data between a database and a simulation, the preprocessing and running of models, and the extraction, post-processing, and reporting of results for multiple stakeholders. The preprocessing automation varies a range of input parameters based on operation requirements for sensitivity analysis. The sensitivity simulations are automated using a command shell feature without using the simulation graphical user interface (GUI). The post-processing automatically extracts output results and generates a summary of optimized setpoints.

With this innovation, the preprocessing automation significantly reduces the time taken to prepare for model simulation as it was previously done in a manual fashion. The automated model execution substantially reduces the time required to simulate a large number of runs as it eliminates the need to perform the simulations manually via the GUI. Furthermore, the post-processing automation significantly reduces the time taken to extract output results, which helps with faster identification of slugging severity and its corresponding mitigation of optimized valve opening.

The solution enables the operator to efficiently simulate multiple production scenarios to identify the severity of the pipeline slugging, predict the impact of the surge volume, and provide a faster recommendation of valve opening for operational action at the central processing platform (CPP). The Python programming is implemented with an open framework, thus allowing the solution to be flexibly customized and can be scaled for any other Chevron-operated fields that require similar workflows in the future.

Combining flow-assurance domain and data-science expertise, this project has innovated an automated solution that enables a faster slugging detection and advisory to optimize operational uptime. This could pave the foundation for more advanced workflow automation in the future to efficiently manage flow-assurance performance in oil and gas fields.