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PIPESIM Simulator Increases Incremental Gas Production in Mature Fields by 10%, Ukraine

UkrGasVydobuvannya replaces manual workflows with a multiphase flow simulator to efficiently identify wells with liquid loading issues and improve flow assurance

CHALLENGE
The operator needed to eliminate unstable production, mitigate hydrates, identify booster compressor power, and quantify extra production.

SOLUTION
The PIPESIM* steady-state multiphase flow simulator was used to

- verify production regimes or operating envelopes for wells with liquid loading
- determine the operating envelope to avoid hydrate formation
- identify the power requirement for the booster compressor.

RESULTS
Simulator models enabled the operator to

- achieve a 10% production increase from three mature fields
- create a more stable operating envelope for 55 wells with liquid loading
- realize 22,000-m³/d extra capacity through improved artificial lift methods simulation.

Better manage production and infrastructure challenges in mature fields
UkrGasVydobuvannya (UGV) is the largest natural gas production company in Central and Eastern Europe. As part of the company's strategic initiative to increase its natural gas production to 700 Bcf, it had to overcome three major challenges.

First, there was a need to eliminate unstable production from most of UGV's producing wells due to liquid loading. Second, hydrates were forming in the main trunklines. The production network is composed of six main trunklines of more than 10 km each. The third challenge was the design of a new booster compressor and rerouting of the production.

The legacy analytical tools used by the UGV engineering team were not able to account for the full physics of the multiphase flow from the wells, making it challenging for them to efficiently identify wells with liquid loading problems, select the best intervention method to bring wells back online, create optimal artificial lift designs, manage hydrate formation, and identify infrastructure bottlenecks.

To overcome these challenges and reach its production targets, UGV selected Schlumberger to provide a simulation software solution.
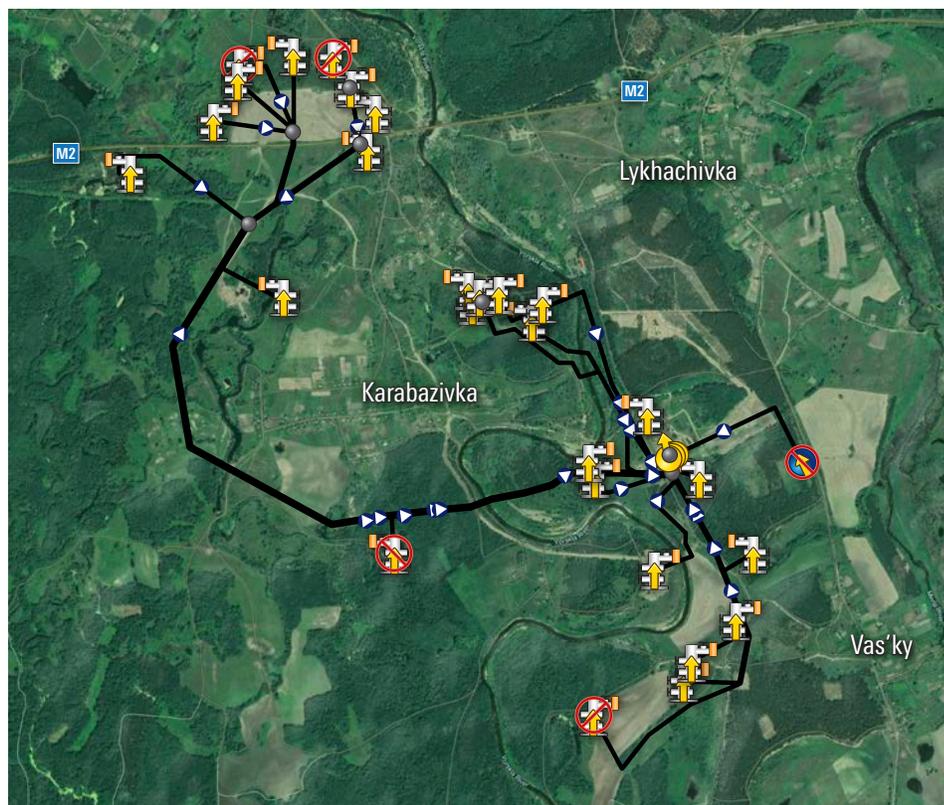
The PIPESIM simulator was selected to help increase production in three mature fields, verify production regimes for 55 wells with liquid loading, and determine the operating envelope to avoid hydrate formation.

Use a multiphase flow simulator to improve performance fieldwide

Manual and analytical workflows were replaced with computer-based numerical simulation using the PIPESIM simulator to provide an effective decisions-support platform for the UGV engineering team.

Schlumberger helped UGV identify the right dataset, perform QA and QC of the field data, build a network model using the PIPESIM simulator based on 10 wells, and then gradually scale up to 69 wells for three interconnected fields. During creation of a pipeline network, a significant amount of time was spent automatically exporting digitized topology data into the PIPESIM simulator from the UGV's GIS data.

The model created had a detailed description of each well including a full wellbore diagram, inclusive of perforation intervals, deviation profiles, heat transfer coefficients, inflow performance data, detailed geometry profile and pipeline characteristics, compositional data for the fluid, and soil conductivities and temperatures. Pressure was set up at the boundary conditions in the central process facilities and the network model was matched against production rates and pressure at source point and intermediate points along the network. The matching process was carried out first by trunklines individually, then all together. The result was a model that proved its quality with an accuracy of more than 95% for pressure and rates.

The PIPESIM simulator was used to verify production regimes or operating envelopes for wells with liquid loading issues. This enabled the company's engineers to reduce unplanned downtime due to liquid loading by choosing the right production regimes. The company identified maximum production potential for each well and was able to understand the spare capacity to meet the increased demand for gas in winter while improving well performance and the lifespan of the reservoir. The network performance was also analyzed and fine-tuned for winter and summer production demands.

Furthermore, the PIPESIM simulator enabled the UGV engineers to generate field simulations with 1,800+ wells in minutes instead of days thanks to a single interface for both wells and pipeline networks simulation, superior modeling capabilities with its parallel solver, automated correlation matching, and ability to visualize the results both in the conventional way and on the GIS network view, enabling easy identification of current and future bottlenecks.

Increased gas production and avoided deferred production

With the PIPESIM simulator the UkrGasVydobuvannya engineering team was able to simulate several fields that shared the same infrastructure. The results were a 10% incremental production increase through a downtime reduction for the wells and debottlenecking gathering networks, a more stable operating envelope for 55 wells with liquid loading issues to avoid deferred production, and extra capacity of 22,000 m^3/d through improved artificial lift methods simulation.
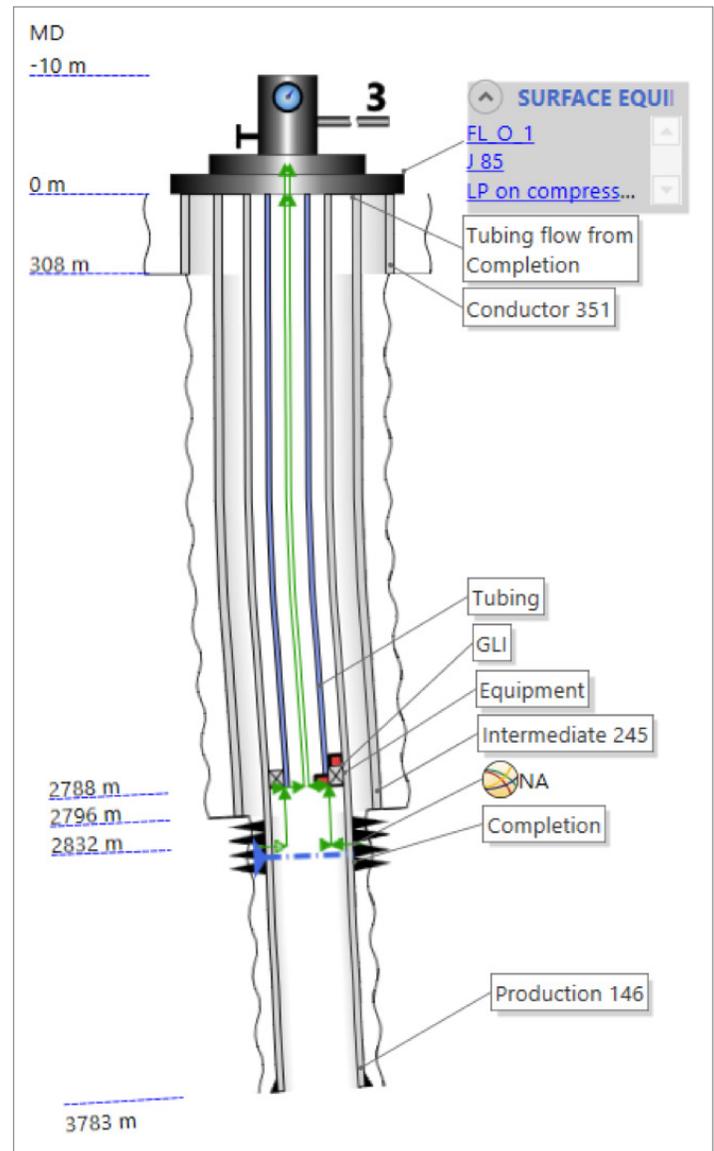
The model created for UGV using the PIPESIM simulator included a full wellbore diagram for each well.

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