Using AI to Address Hidden Inefficiencies in Gas-Lifted Wells

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Abstract:

Important innovations enable us to do something faster and then do the impossible.

Gas-lifted wells are challenging to manage because they hide their inefficiencies. Gas-lifted wells typically continue to produce, even if they have problems that hurt production. Finding the underperforming wells in a field of several hundred wells is extraordinarily time-consuming since thorough analysis of a single well requires 2 – 4 hours of work. The type of tasks needed for gas lift surveillance and analysis include:

1. Continuously gather data, including updates to the completion, well tests, pressure surveys, tracer surveys, real-time data.
2. Identify old, missing, or conflicting data.
3. Calibrate the well model using the latest good data.
4. Evaluate factors such as tubing size, the potential for liquid loading, injection depth, gas lift rates, back pressure, etc., in a systematic manner.
5. Identify the main problems and opportunities.
6. Evaluate production improvement economics.
7. Rank all the opportunities.

Some of these tasks, such as gathering data, surveillance of data, and repeating similar analyses, are simply tedious. Other tasks, such as model calibration, require understanding the physics underlying gas lift. Still, other tasks such as modeling, analysis, and optimization rely on knowledge that a production engineer gains through experience with gas lift.

Building and keeping gas-lift experience is a challenge. Tedious work of any type is not attractive to engineers in the long term. Engineers do and must focus on their urgent, higher cost/risk work (workovers, new completions, well design, etc.). The talent shortage in some parts of the oil industry is acute. Consequently, companies find it challenging to maintain enough staff with enough experience to perform frequent gas-lift well reviews over the long run.

Because operators do not have the resources to review the performance of every well in a field frequently, they typically hold periodic optimization campaigns. Between campaigns, gas-lifted production opportunities accumulate. It is common for the timing between gas-lift optimization campaigns to be 1 or 2 years.

For these reasons, continuous surveillance and detailed analysis of gas-lifted wells has previously been impossible. This presentation describes how we use artificial intelligence to emulate the work of experienced gas lift engineers continuously—every well in a field every day—so that all possible barrels are produced.

Our approach leverages gas lift analysis workflows used by production engineers across the O&G industry. We integrate software that performs mundane tasks such as data gathering, physics-based models and algorithms, gas lift domain knowledge, and commonly used analysis rules of thumb. We will explain why this type of service has not been possible until now. And we will explain why human gas lift experts should be used alongside AI.