

## Engineering approach in developing and optimizing troubleshooting procedures

**Authors: Tom Basic, Chevron PE, Sriram Chandrasekhar, Chevron PE**

### Abstract

Annular gas lift wells often exhibit intermittent or declining performance that cannot be easily explained through surface diagnostics alone. This paper presents a practical method for troubleshooting underperforming annular gas lift wells using dynamic simulation in Petex PROSPER. The objective is to determine whether gas lift design or mechanical issues are contributing to instability, and to evaluate changes that could improve well performance, such as valve configuration or unloading procedures. By simulating real-world transient behaviors, this method helps reduce costly trial-and-error field interventions.

#### **Methods, Procedures, Processes:**

Using Petex PROSPER's dynamic simulation capability, multiple wells with annular gas lift were modeled to replicate observed wellhead and downhole pressure behavior. The models incorporated actual completion data, gas lift valve depths and settings, fluid properties, and historical production trends.

A series of troubleshooting simulations were performed, including:

- Testing if original gas lift valve spacing and opening pressures were suboptimal, causing inefficient unloading or poor injection placement
- Simulating washed-out or leaking gas lift valves, and comparing their pressure response to real-time data
- Evaluating the possibility of a tubing leak, especially near the shallow valve mandrels
- Testing the effect of installing dummy valves in shallow mandrels to shift gas injection deeper
- Simulating high-rate unloading procedures to assess the velocity of fluid through GLVs and potential risk of erosion

The simulation results were compared against actual well pressure trends to determine which scenario most closely matched the field behavior.

#### **Results / Observations:**

In many wells, simulation revealed that shallow valves remained active after unloading, injecting gas at the wrong depth and destabilizing the well. Dummying these valves—either in the simulator or in the field—resulted in more stable flow and improved production in the model. Suspected holes in tubing or severely eroded valves also produced pressure trends in the simulator that matched abnormal field behavior, providing a strong case for intervention.

Unloading simulations at elevated rates highlighted the potential for erosion due to excessive fluid velocity through GLVs, prompting recommendations for revised unloading procedures.

#### **Conclusions:**

Dynamic simulation offers a powerful diagnostic tool for evaluating the performance of annular gas lift systems. It enables engineers to test mechanical failure scenarios and design improvements in a risk-free environment, identify root causes of instability, and optimize kick-off and steady-state operations. This approach has led to improved production, reduced downtime, and better-informed decisions on interventions. Field validation of simulation predictions further supports its use as a standard troubleshooting method for gas lift optimization.