2025 GAS LIFT WORKSHOP

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Remote Operated Gas Lift Valves Trials and Lookback in the Permian Basin

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Agenda

- Intro to Remote Operated Gas Lift (ROGL)
- ROGL Trial Project
- Project Overview and Key Success Factors
- Key Findings Issues and Challenges
- Summary of Key findings
- Conclusion

Introduction to ROGL

- Remote Operated Gas Lift (ROGL) utilizes electrically operated gas lift valves connected to a surface communication unit via cables.

- ROGL enables precise control by remotely opening and closing various port sizes at the mandrels.

- Real time pressure and temperature measurements inside and outside of tubing at each valve depth provides an unprecedented level of surveillance, analysis and optimization.

Comparison of ROGL with Conventional Gas Lift

- **Injection Depth**: Conventional gas lift valves often do not utilize the full injection pressure, limiting the depth of gas injection. In contrast, ROGL valves can maximize the injection pressure, allowing for deeper and more efficient gas injection
- **Multi-pointing**: Conventional systems are prone to multi-pointing, especially during unloading, which can negatively impact production. ROGL systems can control multi-pointing more effectively through remote adjustments
- **Surveillance and Control**: Conventional systems typically require additional downhole gauges for monitoring, which are limited to one depth. ROGL systems provide real-time production and injection profiles, offering better surveillance and control
- **Maintenance and Reliability**: Conventional gas lift systems have lower instrumentation demands and are easier to maintain. However, they require more frequent manual interventions. ROGL systems, while requiring more sophisticated setup and maintenance, offer higher reliability and reduced need for manual interventions .

Advantages of ROGL

- **Enhanced Control**: ROGL systems allow for real-time adjustments to gas injection rates and depths, optimizing production and reducing the risk of multi-pointing.
- **Maximized Injection Pressure**: Unlike conventional gas lift valves, ROGL valves can utilize the full injection pressure, ensuring optimal gas injection and improved production efficiency .
- **Real-Time Surveillance & Optimization**: The technology enables real-time monitoring of production and injection profiles, providing valuable data for making informed decisions.
- **Reduced Maintenance**: ROGL systems require less maintenance compared to conventional systems, as they are designed to operate autonomously with minimal human intervention .
- **Operational Flexibility**: The ability to remotely control the valves allows for quick adjustments in response to changing well conditions, enhancing overall operational flexibility .

Disadvantages of ROGL

- **High Initial Costs**: The installation and setup of ROGL systems are more expensive compared to conventional gas lift systems due to the need for additional surface equipment and electrical infrastructure .
- **Complexity**: The technology requires skilled personnel for setup and maintenance, as well as a reliable communication system to ensure continuous operation .
- **Dependency on SCADA Systems**: ROGL systems are heavily dependent on Supervisory Control and Data Acquisition (SCADA) systems for communication and control, which can be a point of vulnerability .
- **Limited Supplier Options**: The market for ROGL systems is less competitive, leading to higher costs and limited options for operators

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ROGL Trial Project

Project Overview and Key Success Factors

The project included trials with multiple vendors (Vendor 1, Vendor 2, Vendor 3) across various wells in the Permian Basin with the following objectives:

Evaluate performance, reliability, and economic benefits of ROGL systems

- **Enhance production efficiency**
- **Compare production uplift against conventional gas lift systems**
- **Achieve autonomous operation**

Key success factors for the ROGL pilot project include:

- **Reliability**: Ensuring the ROGL systems operate consistently with low failures rate.
- **Production Uplift**: Comparison of production uplift achieved by ROGL systems against conventional gas lift systems.
- **Autonomous Operation**: Achievement of fully autonomous operation of the gas lift valves.

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Key Findings, Issues and Challenges

Vendor 1

Issues and Challenges

- **Software Issues**: Vendor 1's trials on 3 wells faced several software-related reliability issues, that had to be progressively addressed with surface controller software upgrades/patches
- **Communication Failures**: One of the wells experienced a failure in communication with the valves, traced back to an installation issue, after 7 months
- **Cablehead Fault**: An investigation into one of the failures revealed that the fault was traced back to the cablehead of one of the units
- **Foreign Material**: During the teardown of a pulled unit, foreign material was found inside the valve section.
- **Sand Ingress**: Significant sand was found packed in one of the units during the teardown

Vendor 1

Key Findings

- **Production Uplift**: Vendor 1's trial showed a 6% BO/16% BOE uplift over 307 days compared to analogue wells
- **Deferred Production:** This group of wells experienced 23% less downtime than their side pocket mandrel counterparts
- **Reliability**: Electric failure was observed after 7 months. Lost comms with one valve in one well after a surface card issue. After software patches, all remaining working valves moved without restrictions
- **Automation:** Automation worked on a few occasions (auto unloading and normal operations) whenever not hindered by communications issues. Automation improved with valve reliability, showing faster recovery from operational disruptions
- **Relationship with Vendor**: Excellent communications between the parties positively contributed to overcoming the many challenges that the trial experienced

Vendor 2

Issues and Challenges

- **Reliability Issues**: Several reliability issues were observed with Vendor 2 valves, including valves sticking and optimizer commands not being received
- **Troubleshooting Efforts**: Various troubleshooting steps were taken, including software and firmware interventions, but issues persisted
- **Next Steps**: Pulled affected wells and sent valves to Vendor 2 for inspection to understand the root cause of the failures

Vendor 2

Key Findings

- **Production Drop**: Trials experienced several reliability issues, resulting in a 20% BO/19% BOE drop over 136 days
  - The failures led to significantly reduced performance, and in some cases, resulted in well kills
- **Deferred Production:** Despite all the challenges this group of wells experienced 11% less downtime than their counterparts on the same pad
- **Reliability**: Completely missed reliability targets due to several valve failures which led to tubing pulls
- **Automation:** Issues made it impossible to enable automation
- **Relationship with Vendor:** Excellent communications and support helped get an understanding of potential failure modes

Vendor 3

Issues and Challenges

- **Installation Issues**: The installation process for the ROGL valves with this vendor initially encountered no operational issues with the valves themselves. However, the process tripled the standard running time of production tubing, adding significant costs.
- **Valve Performance**: A valve in one of the wells was not operational post-POP, despite several troubleshooting attempts. The team suspected an installation issue
  - **Leaking Valve**: Two of the wells experienced a leaking valve, with unsuccessful attempts to seal it
  - **Unsuccessful upgrade:** Workovers to re-install new and upgraded valves resulted in extremely poor performance with valves not responding after a few weeks in the ground
  - **Motor Failures**: several motor failures in deeper valve positions, attributed to higher ambient temperatures and duty cycles. The motors were found to be overloaded, leading to overheating and eventual failure
- **Surface Control Issues**: Intermittent issues with sending controls to the downhole controller caused significant LPO (lost production opportunity)
- **Modbus Communication Issues**: Several Modbus related communication issues

Vendor 3

Key Findings

- **Deferred Revenue**: Despite all the challenges, this group of wells experienced a lower LPO compared to other pads in the same CTB.
- **Valve Utilization**: There is a strong correlation between valve utilization and well performance. Stronger wells used shallower valves for longer periods, while weaker wells switched to lower valves faster
- **Reliability:** Several reliability issues were observed; systems were pulled due to non-functioning valves - all valves failed in a newly re-installed well
- **Automation:** Could not be enabled due to non-working valves
- **Relationship with Vendor:** Several issues communicating with vendor to find solutions

Summary of Key Findings

Criteria	Vendor 1	Vendor 2	Vendor 3
Production Uplift	6% BO/16% BOE uplift over 307 days	20% BO/19% BOE drop over 136 days	N/A
Downtime	23% less than analogue wells	11% less than analogue wells	26% less than analogue wells
Reliability Issues	Electric failure after 7 months; software issues; cablehead fault; observed foreign material and sand ingress; improved reliability on upgraded design	Valves sticking; optimizer commands not received; multiple failures leading to reduced performance and dead wells	Installation issues; valve performance issues; leaking valves; surface control issues; communications issues; valve failures
Autonomous Operation	Achieved autonomous operation with some reliability issues	Faced significant challenges in achieving autonomous operation due to reliability issues	Multiple failures both mechanical and software related; unable to evaluate autonomous operation

Conclusions

- The ROGL valve technology pilot project has provided valuable insights into the potential of ROGL systems to enhance production efficiency and achieve autonomous operation.

- Significant challenges remain, but ongoing trials and improvements offer a promising path forward.
  - Several issues have been observed mostly due to the nascent nature of the technology
  - A solid relationship with service partners has proven to be key in resolving issues and achieving progress

- The project's success will depend on:
  - Achieving key criteria of reliability, automation, and production uplift
  - Securing stakeholder support for further implementation

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Question Time

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