Plunger Assisted Gas Lift
Improving lift efficiency in gas lift wells

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Considerations

Operators are faced with the challenge of maximizing production while maintaining low operating costs. Effective and cost-efficient lift is the goal.

Two cost-effective artificial lift methods:

1. Gas lift
2. Plunger lift
Gas Lift

Applications

- Producing wells with insufficient bottom hole pressure
- Producing deep wells that can’t produce against hydrostatic head
- Initial unloading of a well that will flow later on
- Increasing the production rate of a flowing well
- Accommodating deviated and horizontal well bores
- Producing wells with sand or scale problems
Gas Lift

Operating Considerations

• Presence of formation gas
• High-pressure gas source
• Accommodates a range of GLRs
• Well suited to deviated and horizontal well bores where rod wear might occur
• Unaffected by sand or scale
• Low initial equipment costs
• Easy to operate and maintain
• Long service life
Plunger Lift

Applications

• Producing wells with low bottom hole pressure
• Producing wells with high GLRs
• Minimizing shut-ins
• Minimizing venting to the atmosphere
Plunger Lift

Operating Considerations

• Primarily used in high GLR gas wells
• Controls hydrate and paraffin buildup
• Removes and prevents scale buildup
• Easy to install
• Extremely cost effective
  – Low initial equipment costs
  – Minimal operating costs
Combining Plunger Lift & Gas Lift

Assisting plunger lift with intermittent gas injection is fairly common

- Allows cost-effective plunger lift to be used in atypical well candidates
  - Wells without sufficient gas
  - Wells with higher liquid volumes
Plunger Assisted Gas Lift

Plunger lift can also be used to economize continuous flow gas lift systems

• Continuous flow gas injection is maintained
• Flow-thru (aka continuous flow, bypass) plungers are utilized
• Increased drawdown from shut in reservoir pressure maximizes producing rate
• Production is maintained or increased, while injection gas is minimized
Plunger Assisted Gas Lift

Applications

• When lower operating costs are desired
• When GLR is below what is required to operate the plunger system independently
• When the well is experiencing unstable production
• On multi-well pad sites
  – Lower injection gas requirement often allows one compressor to inject multiple wells
Plunger Assisted Gas Lift

Benefits

• Reduced flowing bottom hole pressure and greater formation drawdown
  – Increased critical velocity is achieved and injection gas requirements are lowered
• Less injection gas = lower operating costs
  – Less buyback gas and/or lower compression required
• Paraffin control
  – Plunger “cleans” the tubing string
• Smoother operation
  – Minimal shut-in time provides constant flow of gas to the compressor and reduces system surging
Flow-thru Plungers

• Require minimal or no shut-in time

• Average fall speed in fluid: 700 feet/min

• Potential fall speed in shut-in well: 2,000 feet/min.
  (conventional plunger fall speed averages 200 feet/min)
Flow-thru Plungers

• Operate in high gas and liquid volumes
  – Minimum daily potential of 250 Mcf/day*
  – Can produce up to 200 Bbl/day
• 400 scf/ft per barrel per 1000 feet of depth
• Optimum operating angle is 40-45°

*Proportionate to line pressure and well depth; as these increase, so does gas requirement
Plunger Lift Installation

- Gas lift equipment (mandrels and valves) are already installed and functional
- Run in or find the seating nipple, monitoring the angle with the wireline
- Set the bottom hole bumper spring in the seating nipple
- Install surface equipment
- Install plunger in well
Case Study: Barnett Well

- Well production fell off due to increasing line pressure
- Well was struggling to unload on gas lift
- Operator wanted to decrease injection requirements to produce the well and reduce compressor costs ($5,000/month)
Case Study: Barnett Well

- Plunger installed
- Compressor removed
Case Study: Barnett Well

- Installed a flow-thru plunger on October 18
- Increased injection gas initially to assist with well unloading
- Once plunger was operating properly, gas injection was slowly decreased
- Gas sales fluctuated then remained steady at previous rates
- Compressor eliminated completely 19 days after flow-thru plunger installation
- Water production is 60-65 Bbl/day
Case Study: Glen Rose Well

- Operator cut out Hot Oil treatments, saving $350/month
- Lowered gas injection requirement allowed for a smaller compressor which saved an additional $2,000/month
- Third-party reserves engineer gave this well an additional 60 MBOE due to production uplift as a direct result of the plunger install
Case Study: Glen Rose Well

Elliott #1

Compressor Swap

2 7/8” Frictionless Bypass Plunger Installed
Case Study: Glen Rose Well

A controller-produced chart from the same well
Conclusion

In continuous flow gas lift wells, Plunger Assisted Gas Lift can provide improved production results, while decreasing overall lift costs.

Benefits Recap:

• Greater draw-down on the formation
• Less injection gas = lower operating costs
• Paraffin control (because of plunger travel)
• Smoother operation
• More predictable production results
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