



LiftSmart

Surface Controlled Gas Lift System

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LiftSmart System Objective

Innovex has created a simple / low-cost system in which gas lift valves can be opened or closed from surface to optimize well production

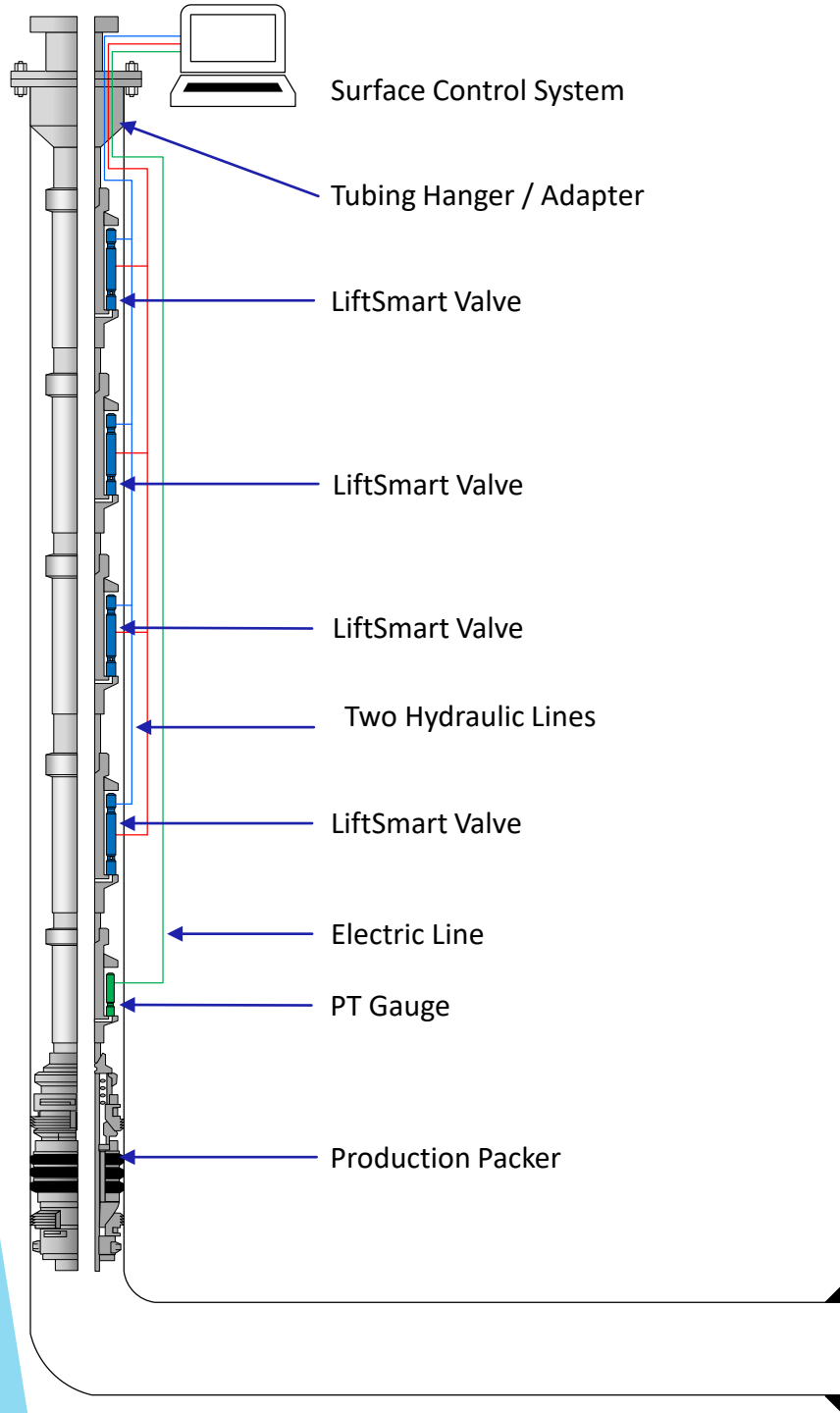
LiftSmart System Objective



Value Proposition:

- Gas injection pressure and rate are completely independent of valve operation
- Early in the life of the well, the system enables deeper gas injection, lowering bottom hole pressure and increasing production
- Potential for a single system to enable lift throughout the life of the well
- Ability for single system to utilize High Pressure Gas Lift, Annular Flow, Tubular Flow, and GAPL without swapping tools
- Valves operate independent of both wellbore and flowing tubing temperature mitigating opening and closing due to incorrect design / setup
- Large stem travel in valve eliminates de-rating of square edge orifice
- Valves operate independent of orifice size improving flexibility of orifice selection
- Easier to trouble shoot system and identify which valve is open

LiftSmart System



System Operation

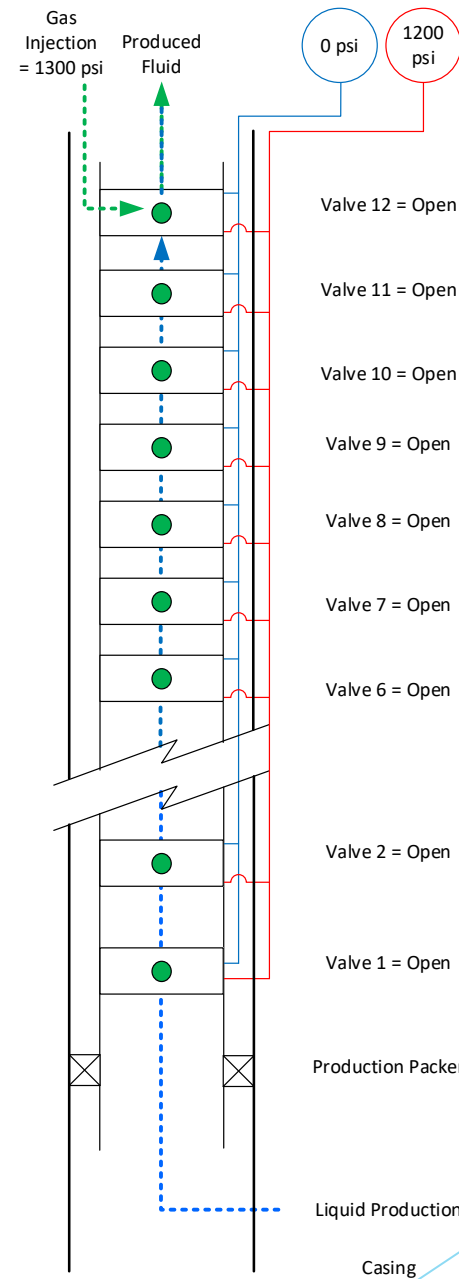
- Gas lift valves opened/closed from surface via 2 hydraulic control lines
- Valves operate independently of gas injection pressure
- Enables deeper injection as well is depleting
- Enables higher pressure injection once at deepest valve

System Components

- Surface Control System
- Feedthrough Tubing Hanger and Adapter System
- Two hydraulic lines from surface run through each gas lift valve
- Electric Line from Surface Control System to monitor Downhole Gauges
- Hydraulically Operated Smart Gas Lift Valves
- Conventional Tubing Retrievable Mandrels
- Downhole Pressure Temperature Gauge(s)
- Conventional AS1-X Style Production Packer with On/Off Tool

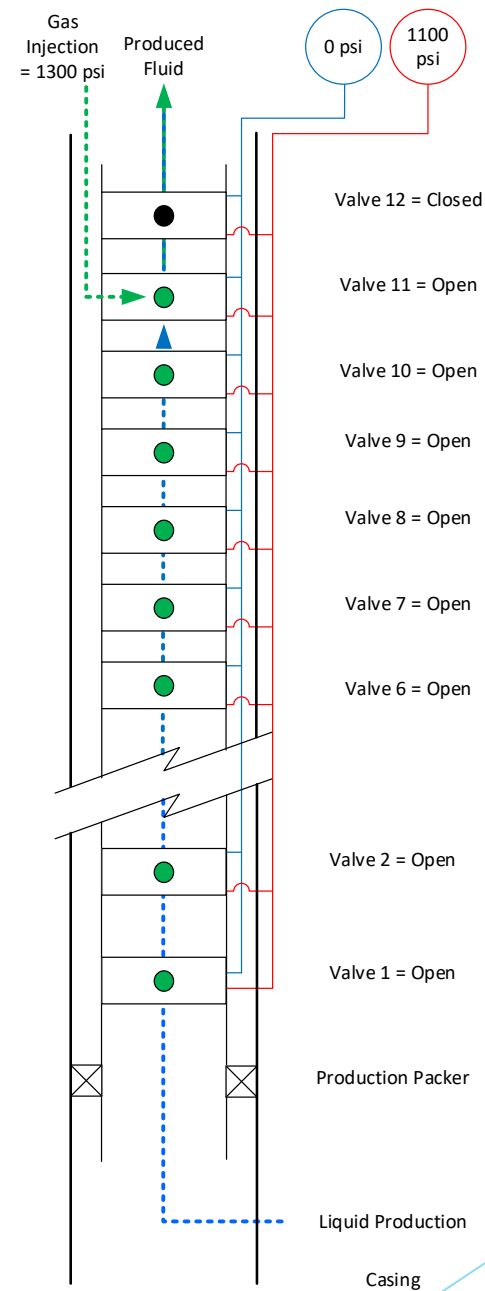
Initial Position

- 1,200 psi on Active Line (Red Line)
- 0 psi on Dead Line (Blue Line)
- All Gas Lift Valves Open
- 1,300 psi Gas Injection Pressure on Annulus
- Gas Injection begins unloading well through Valve #12



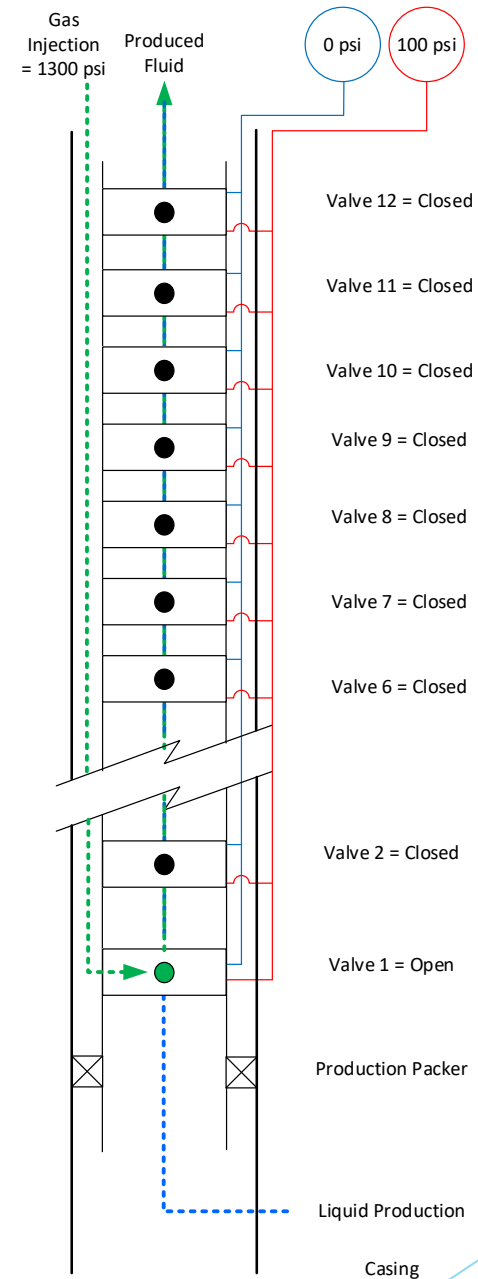
2nd Position

- 1,100 psi on Active Line (Red Line)
- Valve # 12 (Shallowest) Closed; all other valves open
- 1,300 psi Gas Injection Pressure on Annulus
- Gas Injection begins unloading well at Valve #11

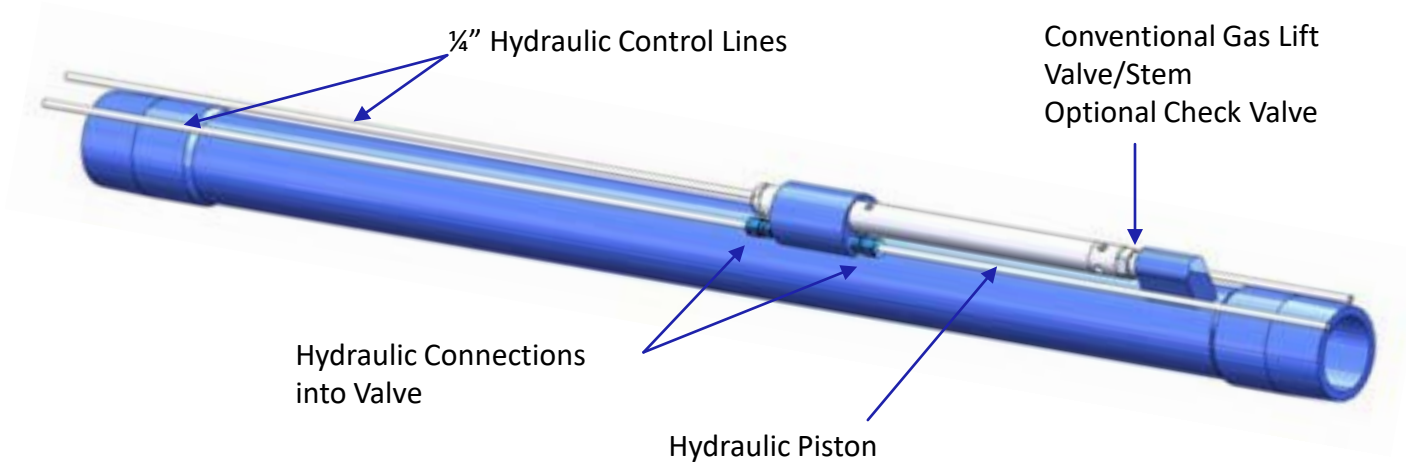


11th Position Fully Unloaded

- 100 psi on Active Line (Red Line)
- Valves #12 - #2 are closed.
Injecting only through Valve #1
- 1,300 psi Gas Injection Pressure on Annulus
- Full Injection Pressure Available to Inject Through Deepest Valve Independent of Previous Valve Settings



LiftSmart Valve Assembly with Mandrel



- Sizes
 - 2-7/8" Tubing x 5 1/2" Casing
 - 4-1/2" Tubing x 7" Casing
- 5,000 psi Tubing to Annulus rating
- 7,500 psi hydraulic system rating
- Conventional / Off the Shelf Gas Lift Seat and Stem
- Valve has a Conventional Gas Lift Orifice that can be configured prior to installation
- Valve has two positions – Open or Close
- Optional Check Valve if required / needed for well operations

Autonomous Surface Control System

- Fully automated and autonomous Surface Control System
- Solar Powered with battery backup – nothing needed from operator facilities / infrastructure
- Contains all necessary equipment to operate downhole valves
- Logic controller monitors surface tubing and annulus pressures and determines optimum injection depth
- System can be connected to customer SCADA system for remote monitoring and control



Simplified Example Parameters



- **Permian Basin - Well Parameters**

- 5,000 psi reservoir pressure
- PI = 1 bpd / psi
- 45° API
- 300 GOR
- 500 mscfd lift gas rate
- 60% water cut
- 1,150 psi gas injection pressure
- 300 psi Flowing Tubing Pressure
- Perforations – 8,900' TVD

- **Conventional Gas Injection System**

- 12 Valves
- 575' bracket spacing
- 20 psi step down at each valve

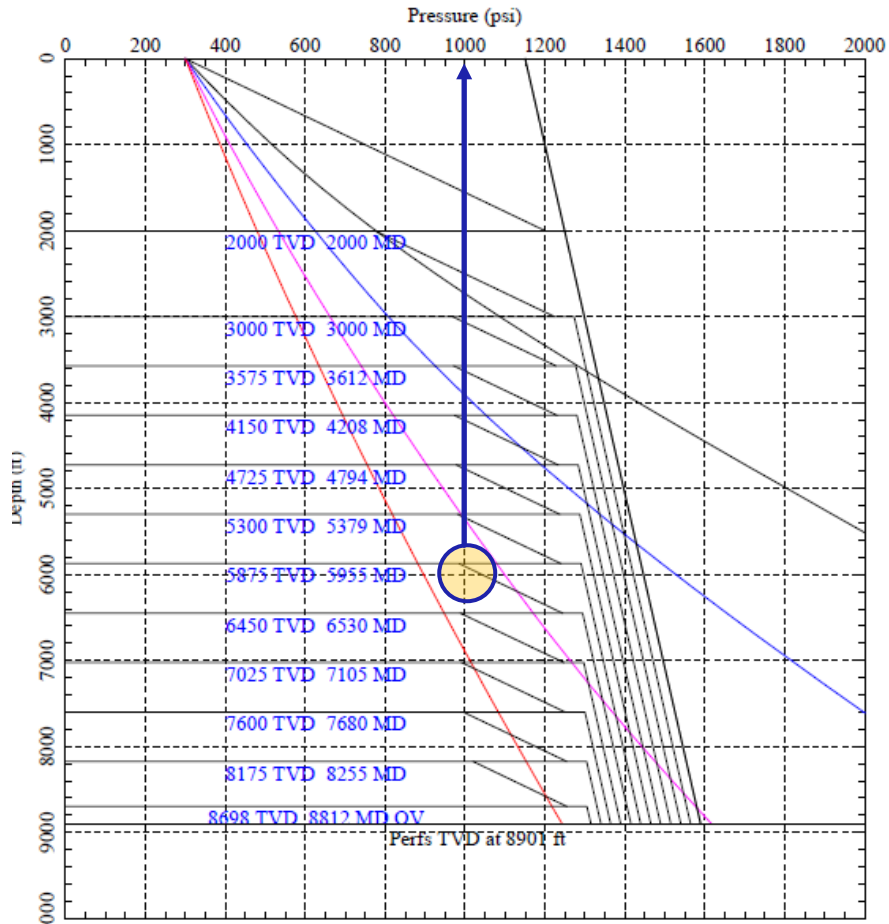
- **Smart Gas Lift System**

- 11 Valves
- 625' bracket spacing
- 0 psi step down at each valve

Gas Lift Design

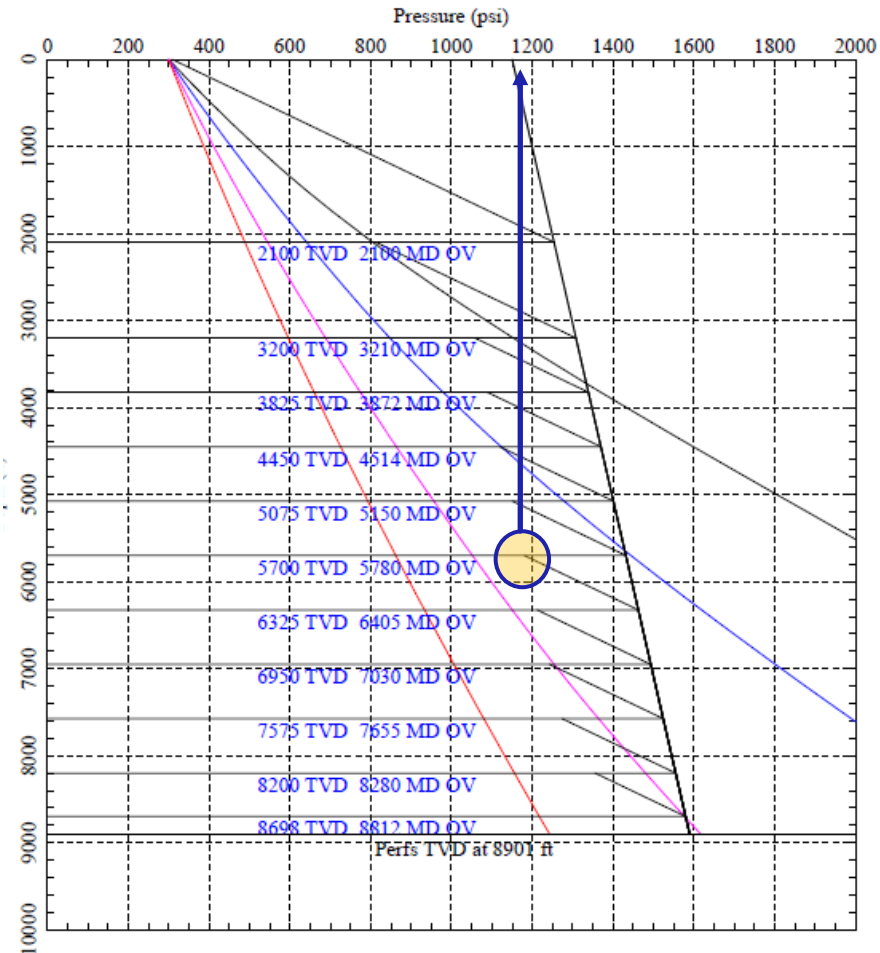


Conventional Gas Lift



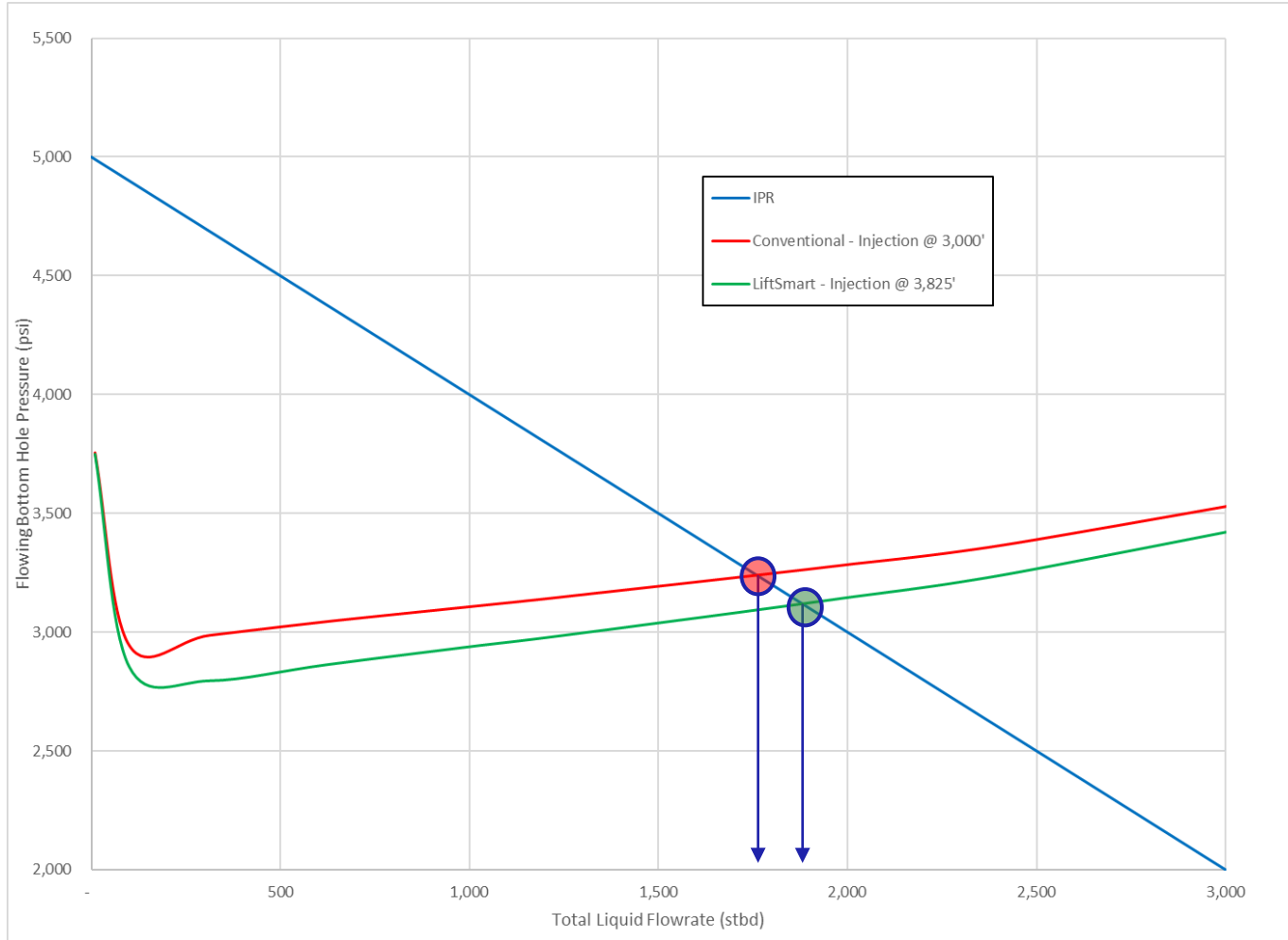
- PWH=300 GLR=300 Rate=2000 WC=60% Flow=H&B
- PWH=300 GLR=600 Rate=1000 WC=60% Flow=H&B
- PWH=300 GLR=1200 Rate=500 WC=60% Flow=H&B
- PWH=300 GLR=2400 Rate=250 WC=60% Flow=H&B

LiftSmart



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Nodal Analysis



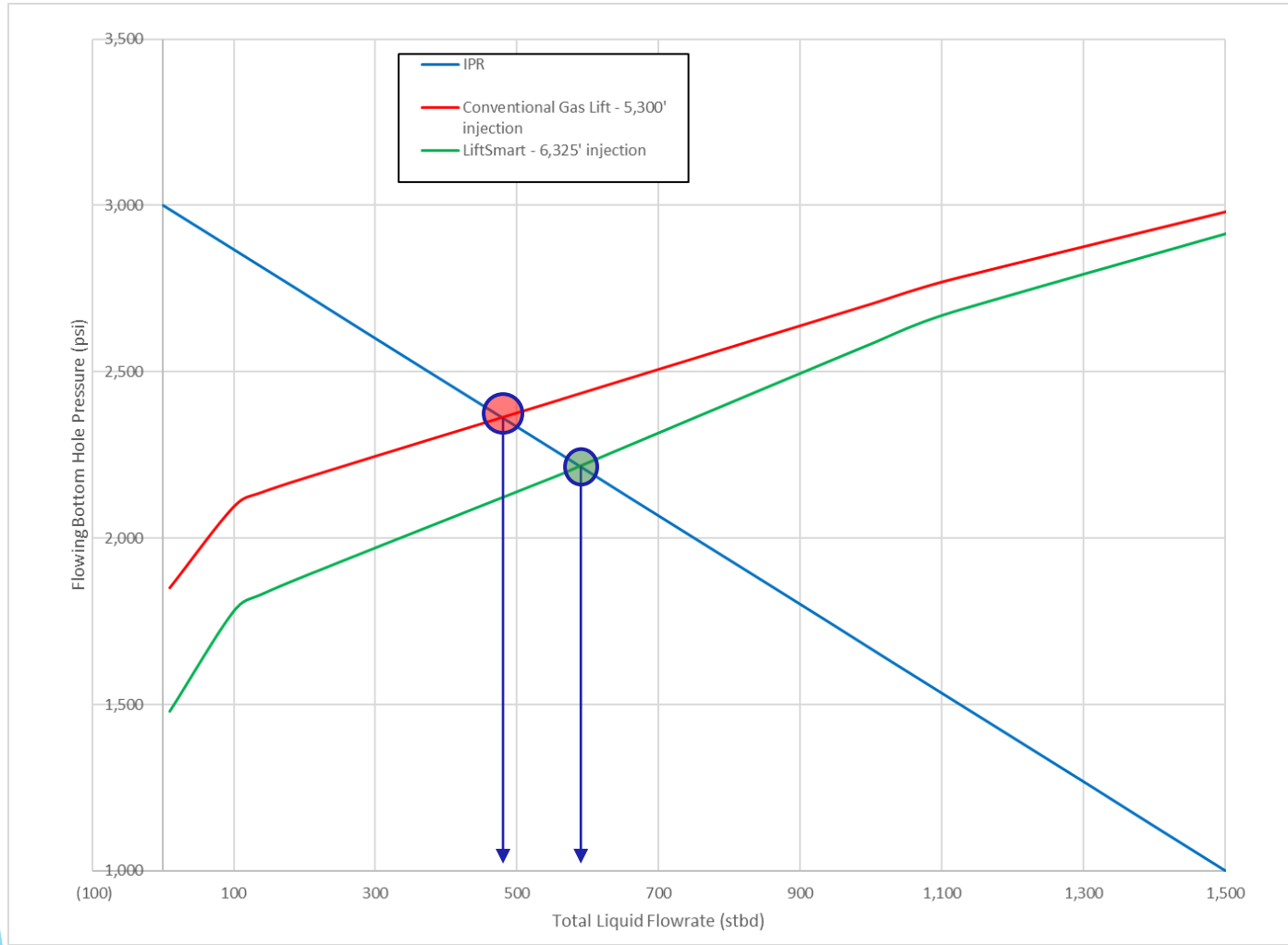
Conventional

- Lifting @ 3,000'
- FBHP = 3,241 psi
- Total Liquid Rate = 1,759 bpd
- Oil Rate = 703 bpd

LiftSmart

- Lifting @ 3,825'
- FBHP = 3,120 psi
- Total Liquid Rate = 1,880 bpd
- Oil Rate = 752 bpd
- 50 bpd uplift

Later in Life of Well (3,000 psi BHP/.75 PI)



Conventional

- Lifting @ 5,300'
- FBHP = 2,363 psi
- Total Liquid Rate = 478 bpd
- Oil Rate = 191 bpd

LiftSmart

- Lifting @ 6,325'
- FBHP = 2,215 psi
- Total Liquid Rate = 589 bpd
- Oil Rate = 235 bpd
- 45 bpd uplift



LiftSmart System Objective

Thanks for your time

Questions?

Value proposition:

- Gas Injection Pressure and Rate are completely independent of valve operation
- Early in the life of the well, the system enables deeper gas injection, lowering bottom hole pressure and increasing production
- Potential for a single system to enable lift throughout the life of the well - High Pressure Gas Lift / Annular Flow / Tubular Flow / GAPL
- Single Point injection for more efficient lift performance
- Valves operate independent of both wellbore and flowing tubing pressures as well as temperatures; making for more reliable open/close at the valve
- Large stem travel in valve eliminates de-rating of square edge orifice
- Valves operate independent of orifice size improving flexibility of orifice selection
- Easier to trouble shoot system and identify which valve is open



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