HEAL System™

The Foundation for Efficient Artificial Lift in Horizontal Wells

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DUG PERMIAN BASIN
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HEAL System Installs

Long-term case histories in multiple basins

Over 200 installs

30 formations
Solution: consistent, regulated flow
Flow conditioning for slug flow mitigation prior to separator and pump
HEAL System: No Moving Parts

1. Seal
   - forces flow into SRS
   - creates large solids sump

2. Sized Regulating String (SRS)
   - variable internal diameter
   - smooths flow
   - reduces fluid density to lift build section of well

3. HEAL Vortex Separator
   - separates solids
   - separates gas
   - avoids generation of foam
HEAL System: SRS

Initial Operating Conditions:
- Low Sandface Pressure
- High Production Rate Relative to $Q_{\text{max}}$
- Frictionally Dominated (Ideal for Stable Flow)

Conventional practice bottom hole pressure curve

HEAL System bottomhole pressure curve
Reduce CAPEX and OPEX:
Fewer, less expensive system transitions

Conventional Strategy

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Producing BHP Comparison

- Ideally want lowest OPEX artificial lift method at the appropriate phase of the decline curve
- Challenge has also been the cost of transitioning between artificial lift methods
- Plunger lift post natural flow period can delay CAPEX of Rod Pumping
• HEAL Slickline System is installed below gas lift system
• HEAL Slickline Separator Flow Through Prong installed (HEAL Slickline Separator is bypassed and isolated from annulus)
• Extends natural flow period as SRS lifts fluids around bend and delays the onset of liquid loading

• Transition to gas lifting without pulling tubing
• Gas lift same as conventional; injecting gas down production annulus
• HEAL System SRS increases production drawdown over conventional gas lifting as fluids are efficiently lifted around bend section and slug flow is mitigated

• Can low cost transition to rod pump without pulling tubing
• With slickline retrieve Flow Through Prong; install HEAL Separator Prong
• RIH and land insert pump/rods into upper nipple profile
• Production casing is open for separated gas
• HEAL System protects pump from gas and solids, as well as maximizes production drawdown
• Solids are separated and settled in HEAL Sump

OPTIONAL: STANDING VALVE
OPTIONAL: FRAC HIT PROTECTION

HEAL Slickline System: Gas Lift and Transition to RP
Case Study: Production Enhancement, Wolfcamp Permian Basin

- The Permian Basin Wolfcamp formation is challenged by depth, high total fluid rates, high watercuts and severe high GOR gas interference.
- Installation in 7 Wolfcamp wells resulted in a sustained +40% increase in production.
- Successful transition from gas lifting to rod pumping.
Reduce OPEX: Enhance Plunger Lift with HEAL System

- First commercial install:
  - Permian Basin Wolfcamp
  - HEAL + continuous flow plunger

- Proceeding as expected:
  - Consistent plunger arrivals
  - Production 2x from rod lift
  - Reduced OPEX
Case Study: Mitigating slugs improves separation

Wolfcamp, Permian

- Slug flow mitigation improves downhole separation efficiency
- Slug flow mitigation solves the root cause of erratic pump fillage with benefit of lowered BHP
- Less stress on rods by avoiding erratic pump fillage
- Stable fluid level allows for effective pump jack balancing
HEAL System™ Full Cycle Artificial Lift Strategy

1. Control flowback
   • Install HEAL System post frac
   • Reduced proppant flowback and fines generation
   • Lower risks and costs transitioning to artificial lift

2. Maximize natural flow period (lowest OPEX)
   • Bend section liquid loading dictates when a well ceases to naturally flow
   • HEAL System designed to extend the natural flow period

3. Eliminate or minimize intermediate artificial lift phases
   • Minimize total CAPEX
   • Enhance the performance of ESP's

4. Transition to rod pump as quickly as possible to minimize OPEX
   • Maximize pump efficiency to extend top end of rod pump capacity (reduce or eliminate intermediate artificial lift)

5. Maximize pump reliability and drawdown
   • Minimize planned and unplanned workovers
   • Lowest BHP possible to maximize rate and reserves
   • Pump protection from gas and solids
   • Offset well frac hit protection
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