Central Optimization Ltd.

When to Install a Dual Stage Plunger Lift

www.CentralOptimization.com

Which are the best applications for value?

- Mature oil and gas condensate well
  - Has it fallen out of optimal range for single stage plunger lift? Upgrading to a dual stage keeps your well productive for longer.
  - Is it deviated? Converting the well allows you to reduce lift costs caused by extensive high tubing wear on rods.
  - Has production fallen? Adding a second stage to existing plunger wells will lead to increased production

- Horizontal liquids rich gas well
  - Are “liquids-bound” or over-saturated in near-wellbore reservoir rocks?

- 30-Day Payouts are common
  - Converting old low rate wells will ensure they are economically viable for longer

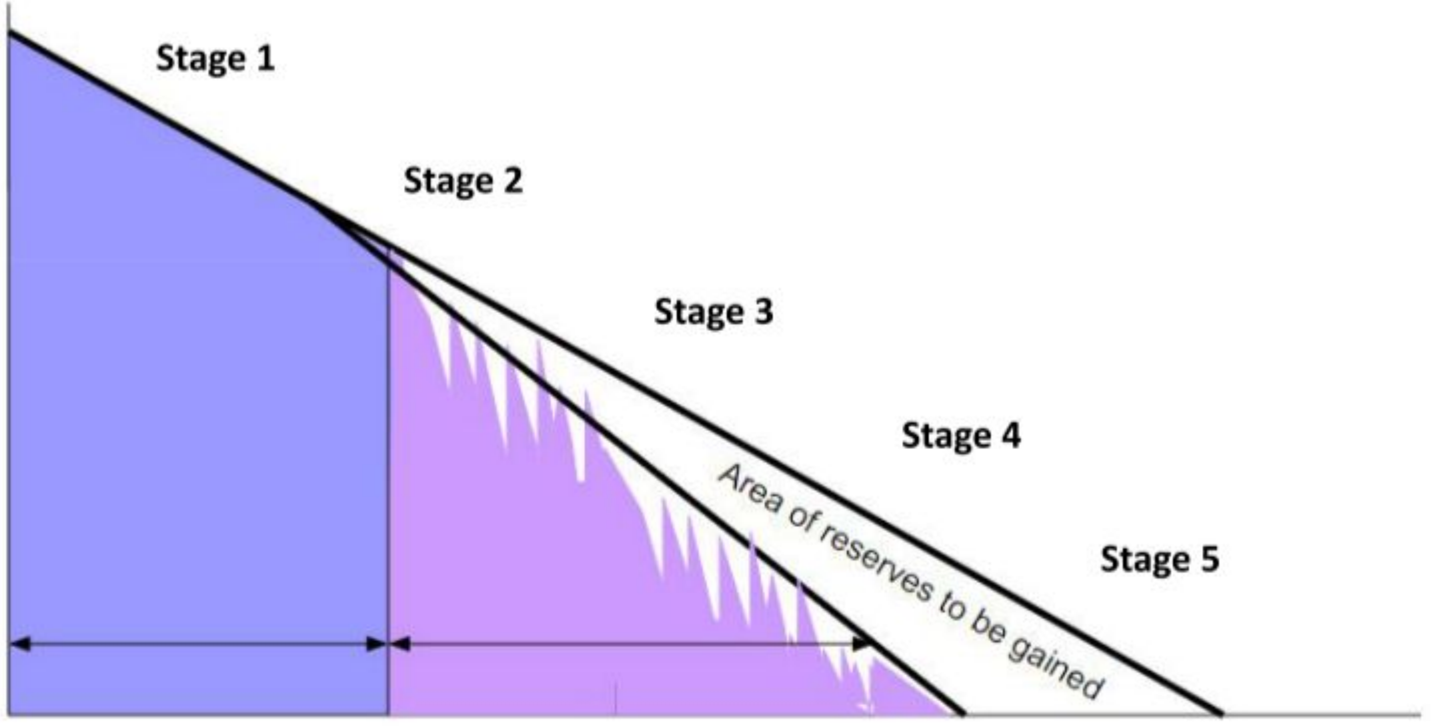
How do you select the best candidates?

- Finding the hidden fruit. Do any of your wells have:
  - Casing pressure higher than tubing
  - Gas rate to liquid rate greater than 1.0 e3m3/day per 1m3/day of predicted fluid/day … our plunger calculator can verify well by well
  - Long off-times with older plunger lift wells (i.e. they take multi-hours to build pressure for next trip)
  - Low rate oil wells on pumpjack, going slow

- Oversized pumpjacks can be moved to horizontal oil plays

How do you maintain a natural decline?

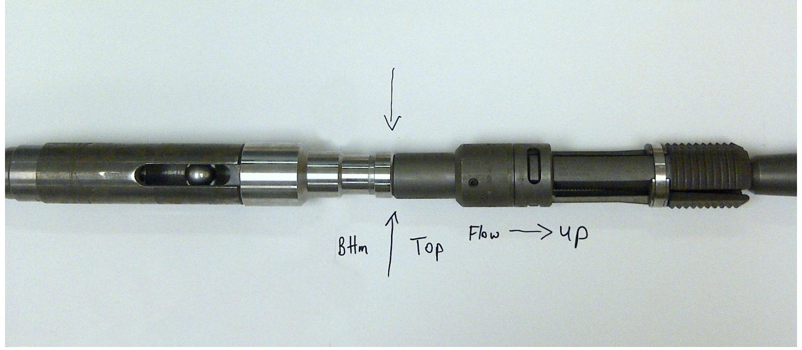
- In order to increase recoverable reserves, we need the right tools that match well potential as it declines:



Stage 1: Well flowing above critical rate
Stage 2: Flowing at critical rate. Opportunity for continuous style plunger to prevent lost production.
Stage 3: Flow beginning to decline. Fast fall style plunger for new semi-continuous dual stage.
Stage 4: Recommend conventional plunger with off time.
Stage 5: Dual stage plunger lift will keep decline rate on its natural trend.

What are the right tools?

- This technology is not new, however we have improved it, and continue to refine it
  - First tool running in
  - Second tool running in
  - A true seal assembly with check ball
  - Strongest tubing lock hold down = STRENGTH



Closeup of the middle assemblies

First tool on the left, second on the right

Dual Stage Installation

- Check bottomhole spring, ensure check ball is present, recommend using Pressure Relief Standing Valve 20# spring. Install BH spring in bottom nipple.
- Drop solid ring plunger (titanium option for longer life & LESS inertia force on mid-section spring assembly)
- Install Dual Stage assembly at 50+% of well depth (CF to midpoint of producing depth), also add a pressure relief valve and 20# spring
- Drop upper stage plunger
- Set controller to depth of midwell assembly to optimize

Typical Results

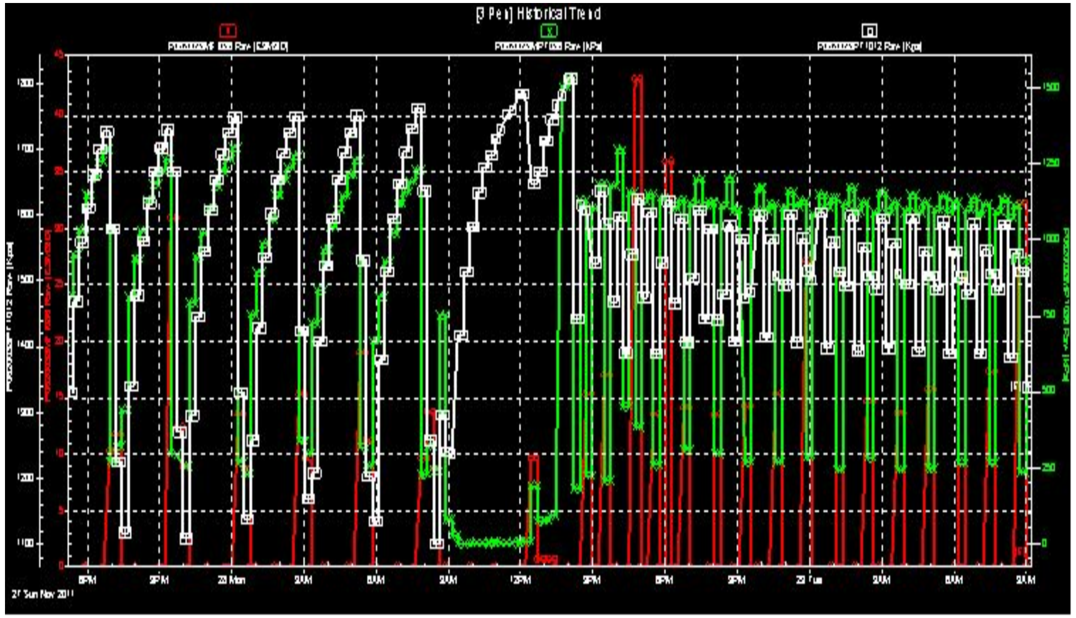
- Sandface pressure is reduced, allowing more inflow into wellbore from reservoir (when compared to a single stage plunger mature well)

- Staging the 2 plungers to lift only 50% of the total lift each = DOUBLE the lifting capacity of liquids (vs single stage plunger)

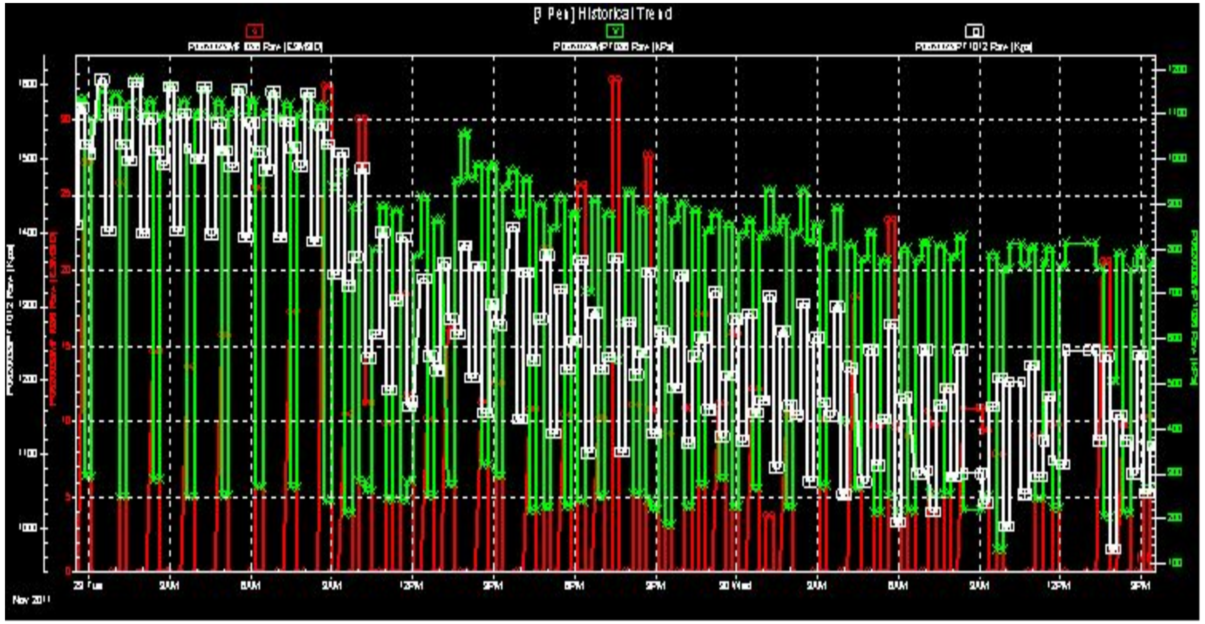
- Typical results have increased liquids production by **40 to 100%**, and gas production increased by **5 to 30%.**

Example Installation Reporting

- Candidate selection is key, we can help you:



Day 1



Day 2
Casing pressure in white

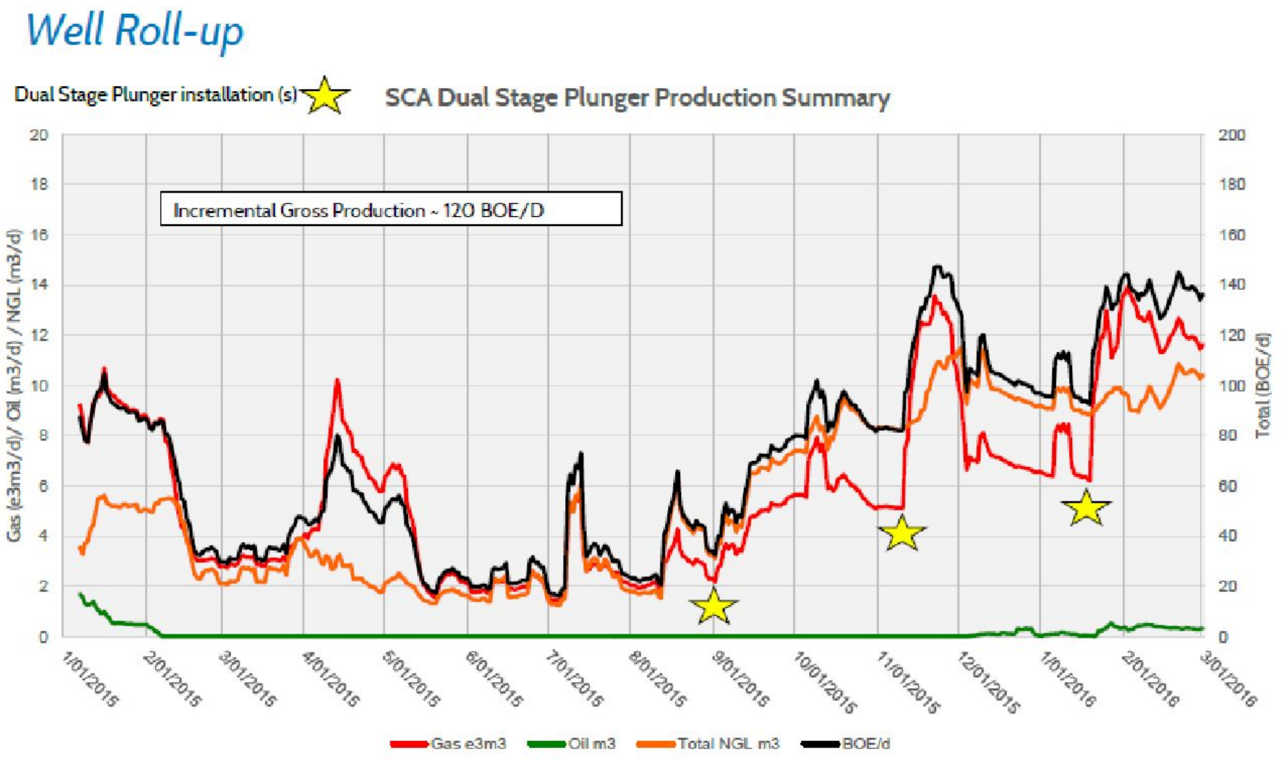
Example Installation Reporting

- Background:
  - 14-23-44-27w4th dual stage plunger lift install, 1784 m of 60.3 mm tubing, Centre Springs set at 1020 mKB.
- During Day 2, well made 1.4 m3 fluid and 4.5 decs on time
  - up to 8.5 hrs from ~ 5 hrs
- Production gains ~ .4 to .5 m3 fluid/day and ~ 1-1.5 decs of gas/day. Liquids are 80% condensate.
- Casing pressure reduced on average by 350 kPa = more inflow
- Shorter lifts = more lifts/day & more inflow.

- BIGGEST GAINS ARE ON MONTHLY SALES (less downtime)
  - $8500 cost, increases of $250/day revenue = 34 Day Payout, RAW terms

Client Well Roll-Up Data

- Uplift after 3 low pressure mature, dual stage installs



Montney Solution: Semi-Continuous Dual Stage

- We have had predictable success using two *very special, Central Optimization-designed* plungers in a Dual Stage setting in a low pressure Horizontal Oil well, “gassy”

- System did not miss a cycle for 6 months (Oct ‘19-March 2020)

- Lifting 8 m3/day liquids 70% oil, with 6.3 e3m3/d Gas

- ~2400m deep is the Bottom Spring, HZ leg beyond

- Similar to “mature” Montney Wells, we achieved excellent results with no added energy. System works with Poor Boy GasLift PAGL/GAPL

About Central Optimization

Leverage our 30+ years experience as we evaluate, test, recommend & identify the upside for your wells.

From plunger lift designs to full plunger installs to replacement parts to systems and servicing – even for former Premier Integrated Technologies (P.I.T) designs – *we are your Alberta-made, go-to plunger lift equipment experts.*