Plunger Lift: SCSSSV Applications

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Agenda

- WHY
- WHAT
- HOW
- Way forward
WHY: background

- Need for effective de-liquification of mature wells with SCSSSV within NAM
- Current plunger technology is used worldwide to efficiently unload LL wells
- More gains than normal Pressure BuildUp due to automatic cycle and efficient unloading
- Cheaper than other de-liquification methods
- New plunger technology designed to mitigate for tubing ID restriction
WHY: background

- Denver conference: idea was born
- LL-conference: project possibility identified
- NAM 3.5” Candidate wells identified
- First Design
- Second Design
- Lab-Tests
- Lab-Tests
- Automatic IP installed

Timeline:

- Q1 2006
- Q2 2007
- Q3 2007
- Q4 2007
- Q1 2008
- Q2 2008
**WHAT: operating cycle**

1. Liquid Loading
   - Plunger hangs in open position under SSSV
   - Liquid in liner+tubing builds up
   - Flowrate declines

2. Shut-in
   - Well automatically shuts in (ROV)
   - Plunger falls in open position

3. Shut-in build-up
   - Plunger reaches bottom and closes
   - Short build-up

4. Unloading (plunger travel)
   - Well automatically opens (ROV)
   - $\Delta P$ lifts plunger+liquid in closed position

5. Flowing well
   - Plunger hangs in open position under SSSV
WHAT: production profile

Flowrate m3/d pre-project: unstable

THP bar pre-project: shut-in cycle (PBU)

Expected flowrate post-project: 30,000 m3/d constant
HOW: SafetyLift System Components

The SafetyLift System is comprised of four major components:

- Bottom Hole Assembly
- Plunger
- Upper Landing Assembly
- Remote operated valve with Controller Unit
HOW: SafetyLift System Components

Bottom Hole Assembly

- Standard Double Bumper Spring
- G-PackOff-Optional
- Type ‘A’ Tubing Stop
- MP-1 Standing Valve Optional

- Installed using standard wireline procedures
- Installed at a pre-determined depth in relation to the well perforations
HOW: SafetyLift System Components

Original Design “High Collapse” RapidFlo Plunger

• Body Components machined to drift through 2.750” diameter of the Safety Valve Landing Nipple

• T-Pad Elements specially designed for increased collapse

• Plunger designed with fewer connections than standard RapidFlo Plungers for increased reliability.
HOW: SafetyLift System Components

New design “High Collapse” Padded Safety Valve Plunger

- Body Components machined to drift through 2.750” diameter of the Safety Valve Landing Nipple
- T-Pad Elements specially designed for increased collapse.
HOW: SafetyLift System Components

Original design Upper Landing Assembly

- Vent Sub
- Ball & Seat (Optional)
- Swab Cup/Sealing Element (Optional)
- Standard Type ‘A’ Tubing Stop
- Inverted Anti-Recoil Bumper Spring w/ “FlowCatch” Strike Rod
- Installed directly below the Safety Valve using standard wireline procedures
HOW: SafetyLift System Components

New design Upper Spring Assembly
HOW: SafetyLift System Components

Controller

- Control system to determine plunger arrival in upper assembly:
  - Flowing THP, system pressure and flow rate measured
  - Typical peaks in signals identified and arrival determined
HOW: Testing Apparatus

- A test well was built for this project
  - Inverted Double Bumper spring
  - Clear Plastic for viewing
  - Compressor with considerable horsepower to deliver gas rates for testing
Way forward

- LL-conference: project possibility identified
- Denver conference: idea was born
- NAM 3.5” Candidate wells identified
- First Design
- Lab-Tests
- Second Design
- Lab-Tests
- Automatic IP installed
- Evaluation
- Installation in 3 NAM wells

Timeline:
- Q1 2006
- Q2 2007
- Q3 2008
Video of plunger during high flow and low flow

Show video
QUESTIONS?
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