Industry First Using Epoxy Based Sealant

to

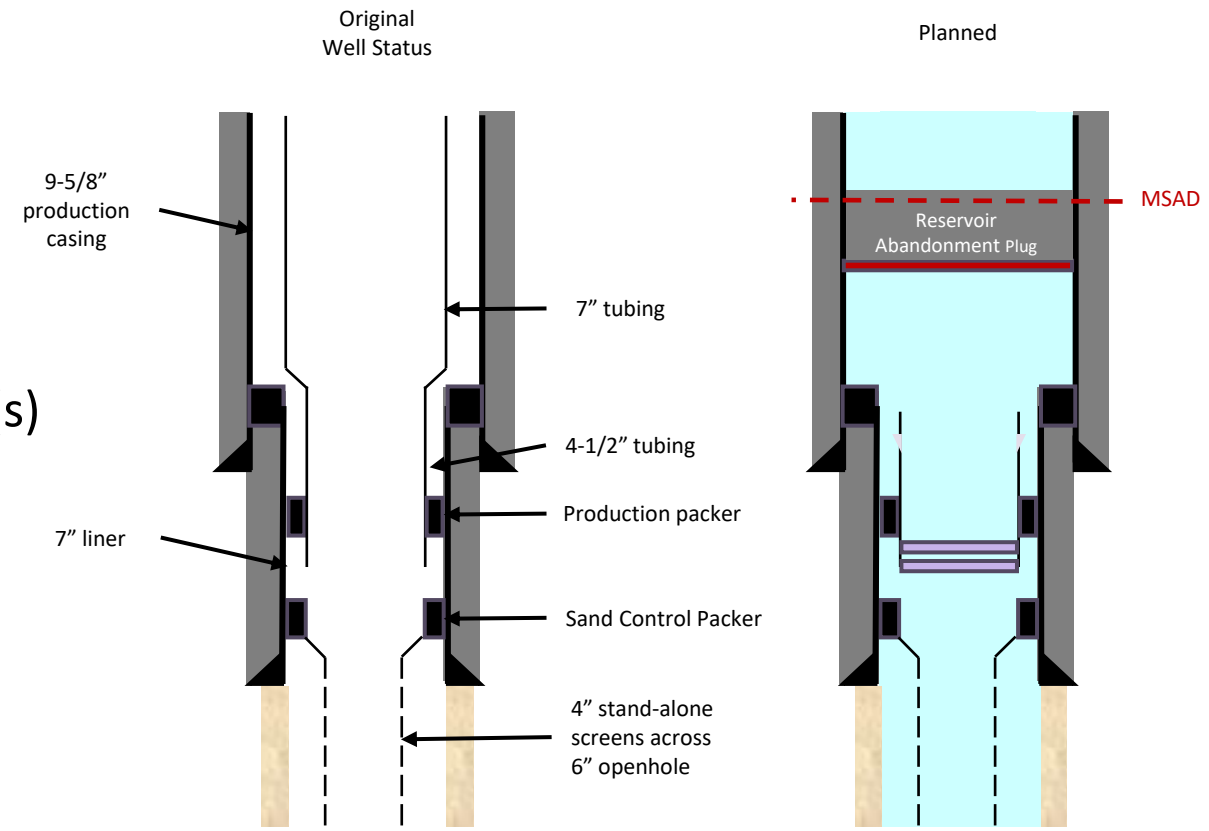
Solve Critical Fluid Loss Issue

and

Support Balanced Cement Placement During P&A Operations

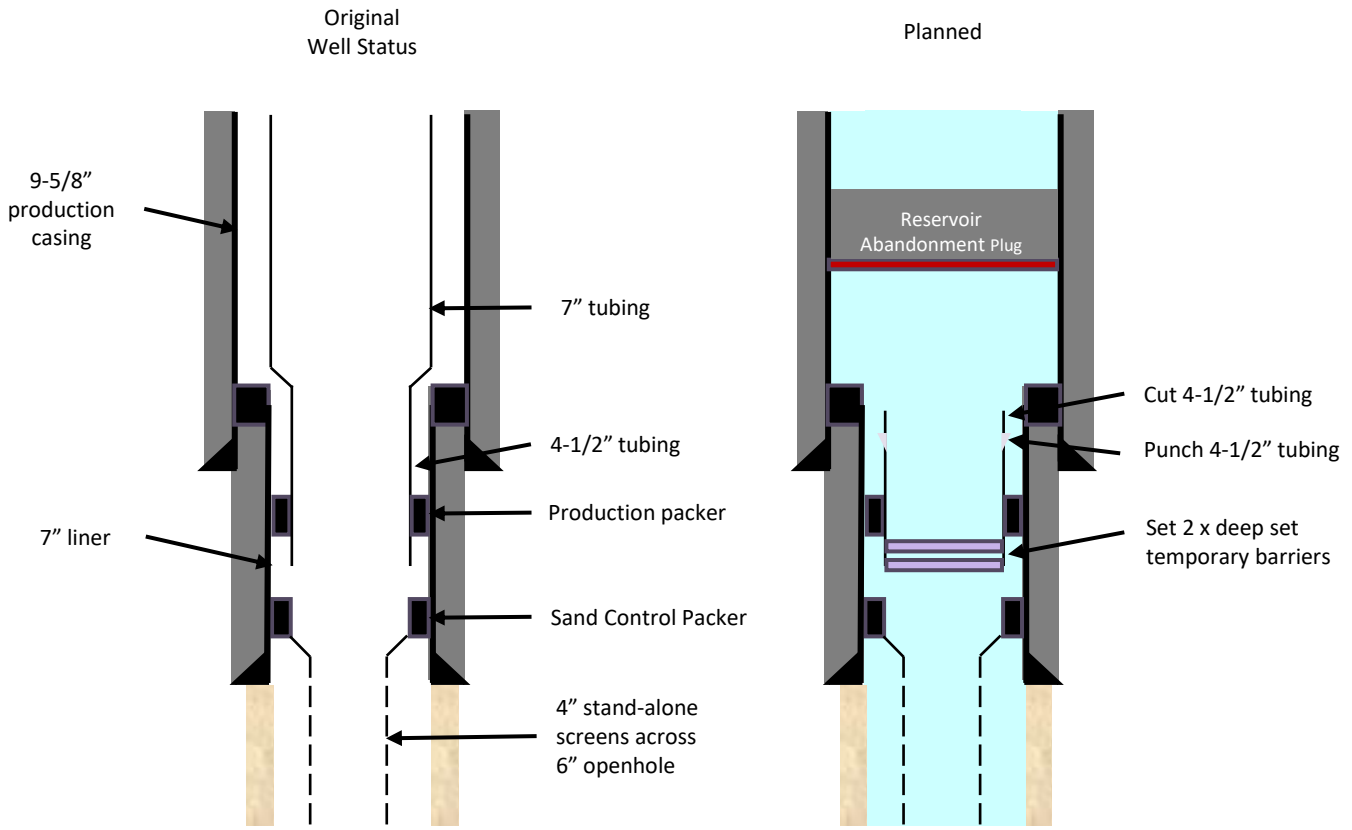
Background

- Rig based P&A
- Gas producer
- Openhole screen-only completion
- Critical problems encountered
  - Tubing collapse
  - Unable to set temporary deep barrier(s)
  - Sustained fluid losses
- Planned contingency(s) exhausted



Original Plan (Reservoir Barrier)

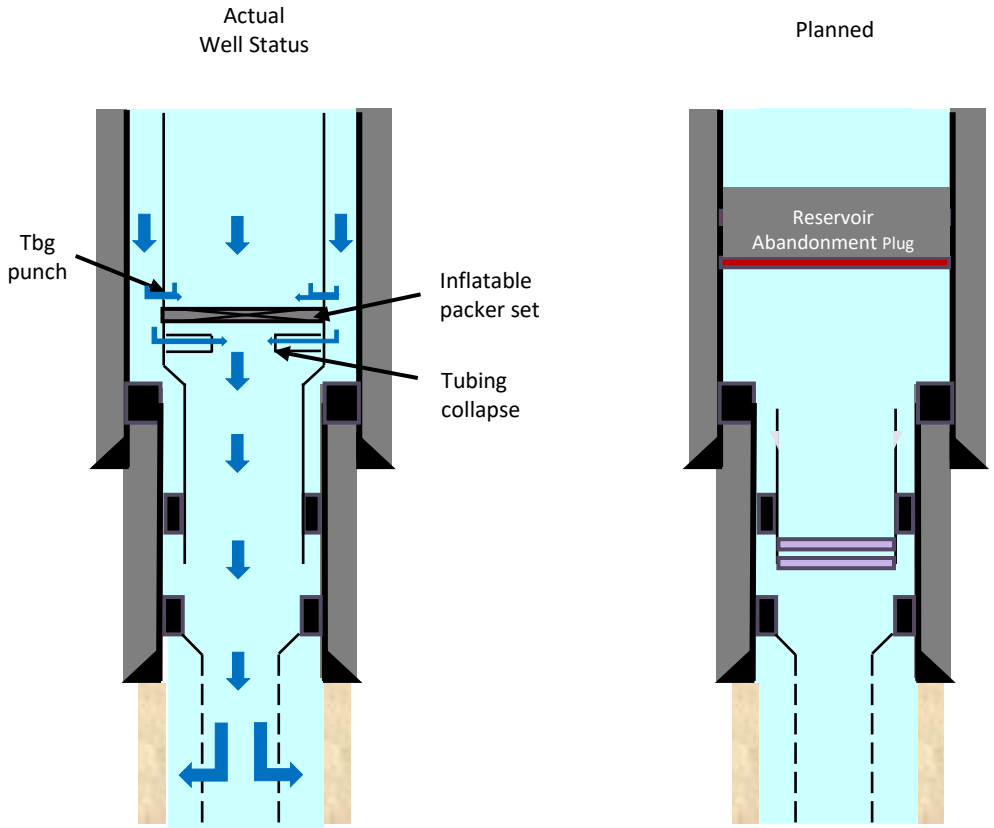
- RIH w/ drift and TRSSSV hold-open sleeve
- Bullhead tbg to reservoir
- Punch tbg above packer
- Bullhead A-annulus to reservoir
- Set 2 x deep set plugs in tailpipe
- Cut tubing
- Recover XT, N/U Riser and BOP
- Recover tbg hanger and tbg
- Set 9-5/8” csg plug
- Pump 1500ft reservoir abandonment plug



Problem

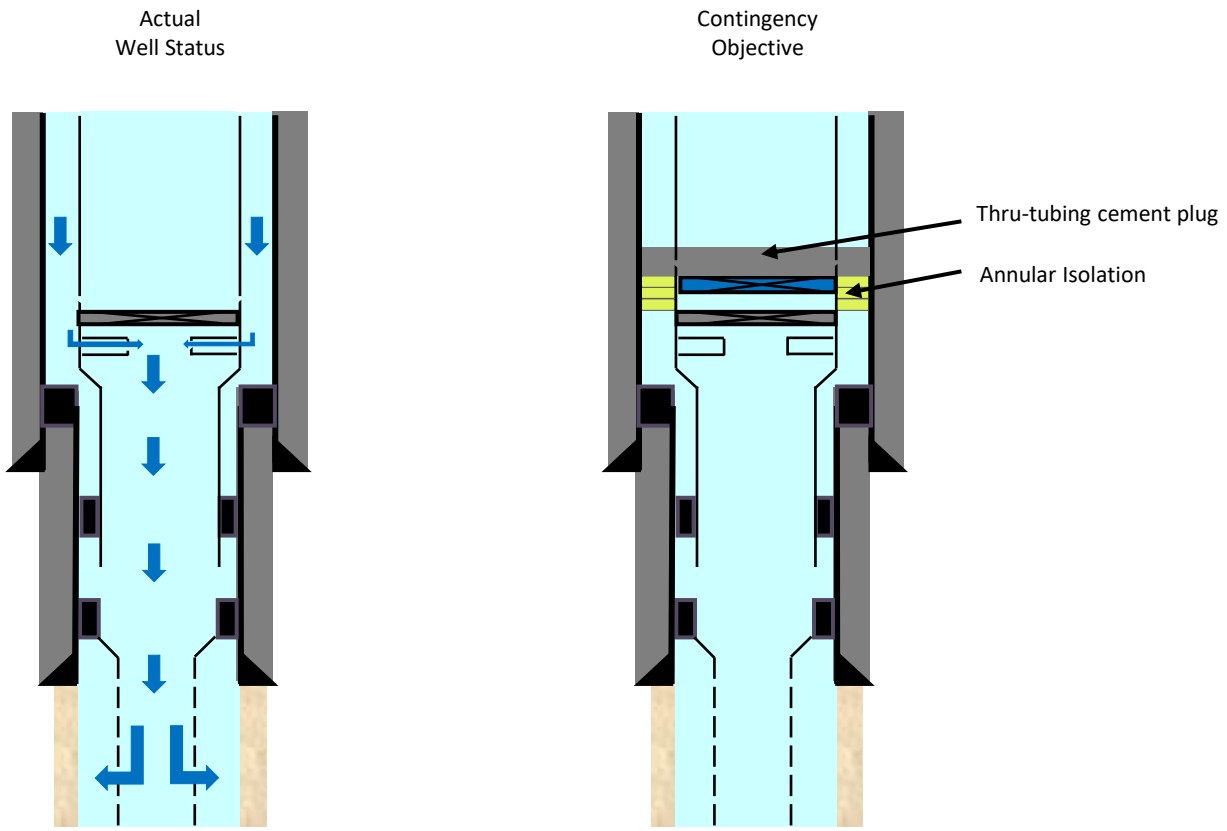
- RIH with HOS and drift
  - Hang up depth (HUD) identified
  - Unable to set deep barriers
  - Suspected tbg collapse
- Punch tubing above HUD
- Bullhead A-annulus and tbg to SW
  - Well on losses
- Pump + 20 fluid loss pills
  - Well remains on losses
- Set inflatable packer
  - Well remains on losses
  - Annular leak via tbg collapse
  - Unable to isolate reservoir
  - Unable to support cement

3 weeks



New Scope

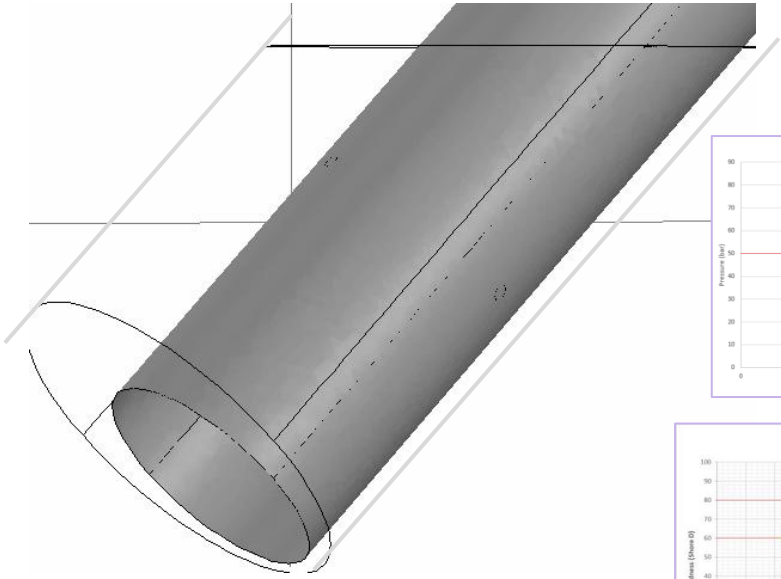
- Enable deep barrier placement
- Establish annular isolation
- Thru-tbg cement plug
- Proceed with well abandonment

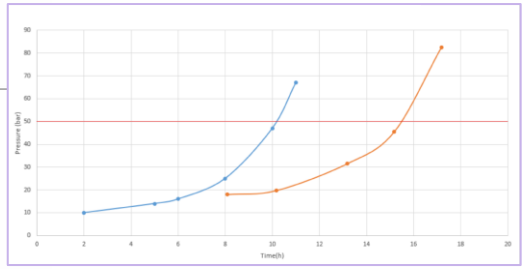


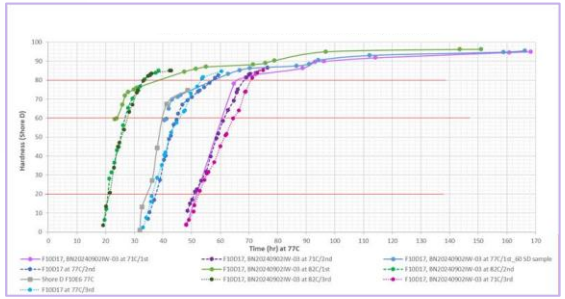
Annular Isolation

- Annular seal ‘outside the wellbore’
- E-line conveyance/precision
- 1-run to perforate & inject, real-time control

- Ultra high viscosity ‘doughnut’ (no slumping)
- Cures with temp & time (highly adjustable)
- Vertical or Hz wells (open, cement, gravel)



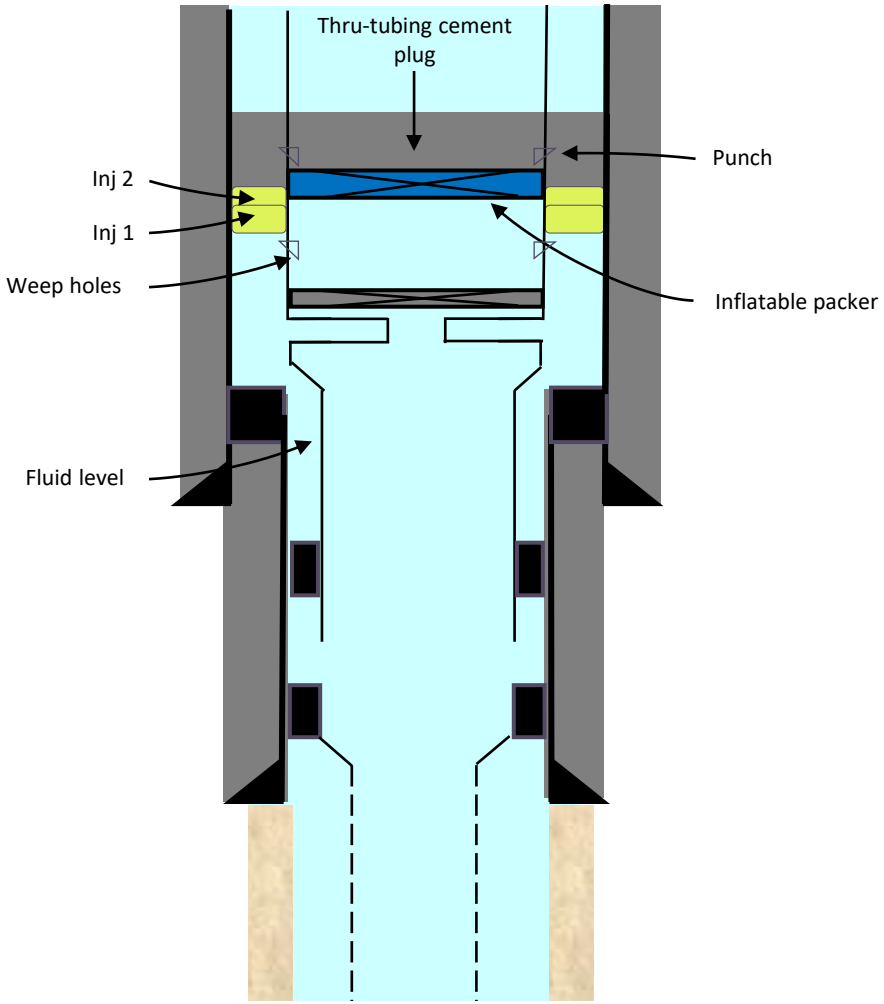





The tool is run into the well

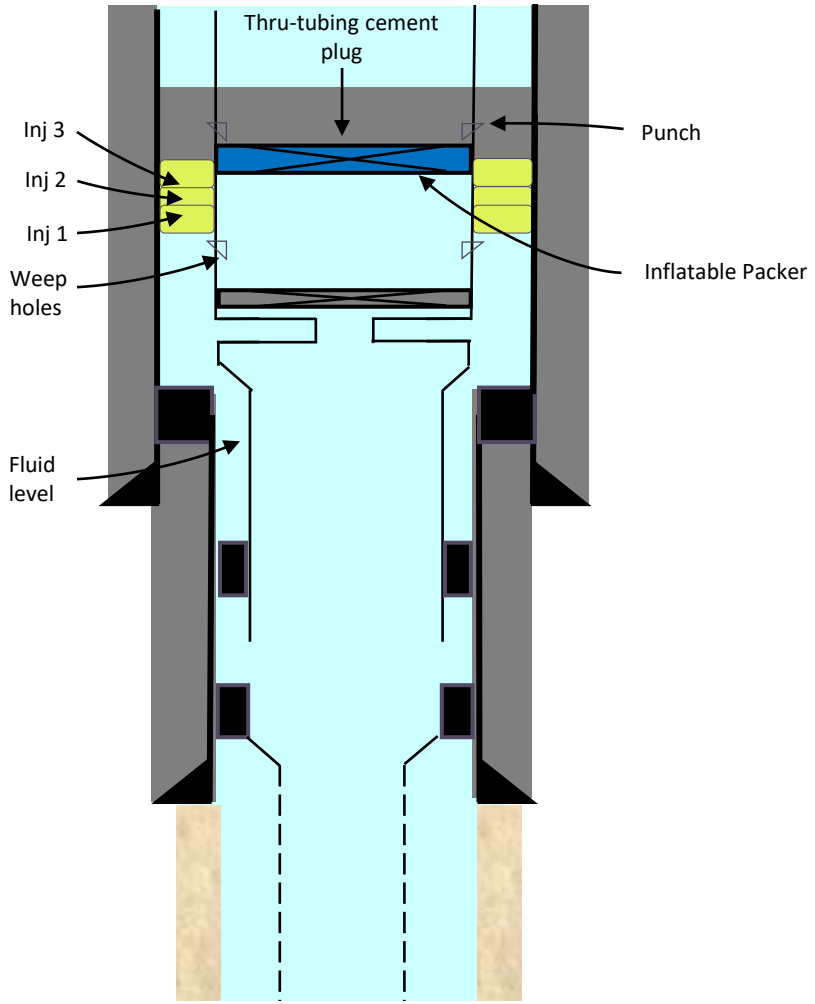
Scope

1. Punch tubing (new weep holes)
2. Allow fluid level to drop/balance
3. Epoxy injection 1 (~ 2.5m annular plug)
4. Epoxy injection 2 (~ 2.5m annular plug)
5. Bleed off annulus – inflow test
6. Set inflatable packer
7. Bleed off tubing – inflow test
8. Punch tubing
9. Pump thru-tubing cement plug



Run Summary

1. Punch tubing (new weep holes)
2. Allow fluid level to drop/balance
3. Epoxy injection 1 (~ 2.5m annular plug)
4. Epoxy injection – miss-run
5. Epoxy injection 2 (~ 2.5m annular plug)
6. Epoxy injection 3 (~ 2.5m annular plug)
7. Bleed off annulus - inflow test 30 mins
8. Set inflatable packer
9. Bleed off tubing - inflow test 30 mins
10. Punch tubing
11. Pump thru-tubing cement plug
12. Pressure test cement via tubing and annulus

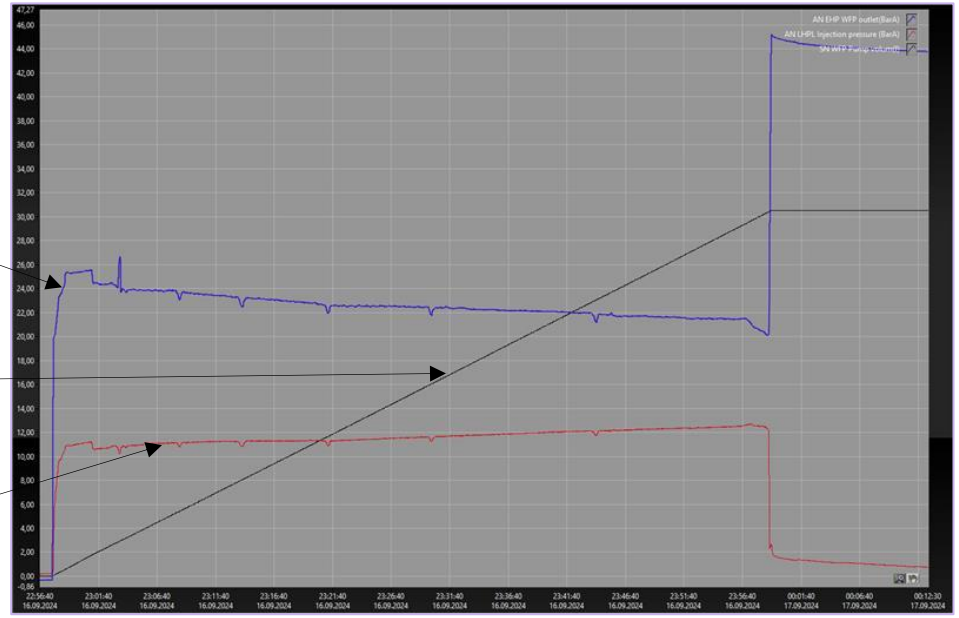


Downhole Annular Injection

Pump pressure

Injected volume

Injection pressure



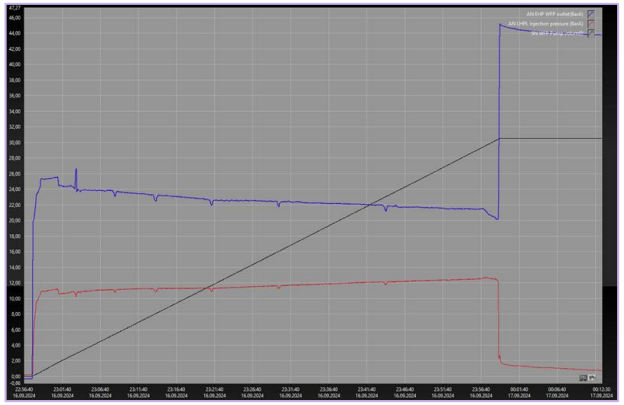
Sub Assembly 3
Anchor & Stroker
Control & Communication Module
Well Fluid Pump

Sub Assembly 2
Sealant Cannister
(OD and length adjustable)

Sub Assembly 1
Injection Module
Perforation Module

Key Findings

- → Rapid call-off - sail SVG to SNS
- → Detailed ‘plug-the-well-on-paper”
- → Puncher charges – well specific test
- → Epoxy ‘temp window’ estimated
- → Valuable real-time data (temp, pressure)
- → 1 x miss-run
- → 3rd injection - added assurance



Results

- Urgent annular isolation successful
- Critical fluid loss issue fixed
- Thru-tubing cement plug set/tested
- 10 days (annular isolation call-off to return)
- 1st use ‘epoxy foundation + cement’
- Enabled well abandonment