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When Wireline Won't Work: Coil Tubing Gas Lift Valve Retrieval

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Abstract

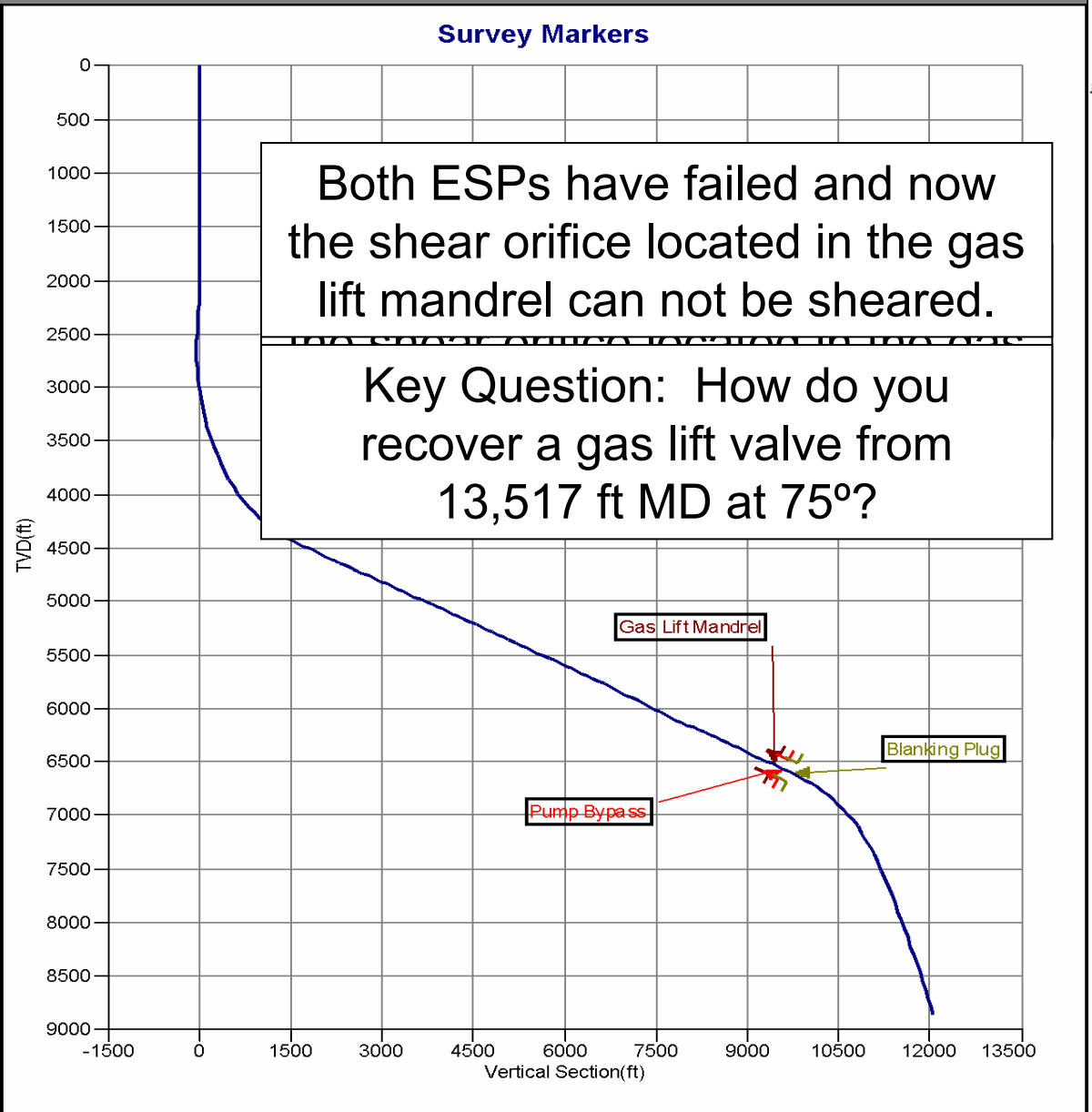
- As highly deviated, complex wells become more common in offshore oil production it is expected that the use of unconventional methods (coil tubing, wireline tractors, etc.) for gas lift valve retrieval and setting will increase across the industry.

- Review ExxonMobil's experiences utilizing wireline and coil tubing for gas lift valve retrieval and setting in highly deviated wells.

- A detailed case study will be presented on a retrieval attempt made at the Heritage field (Santa Ynez Unit) in California.

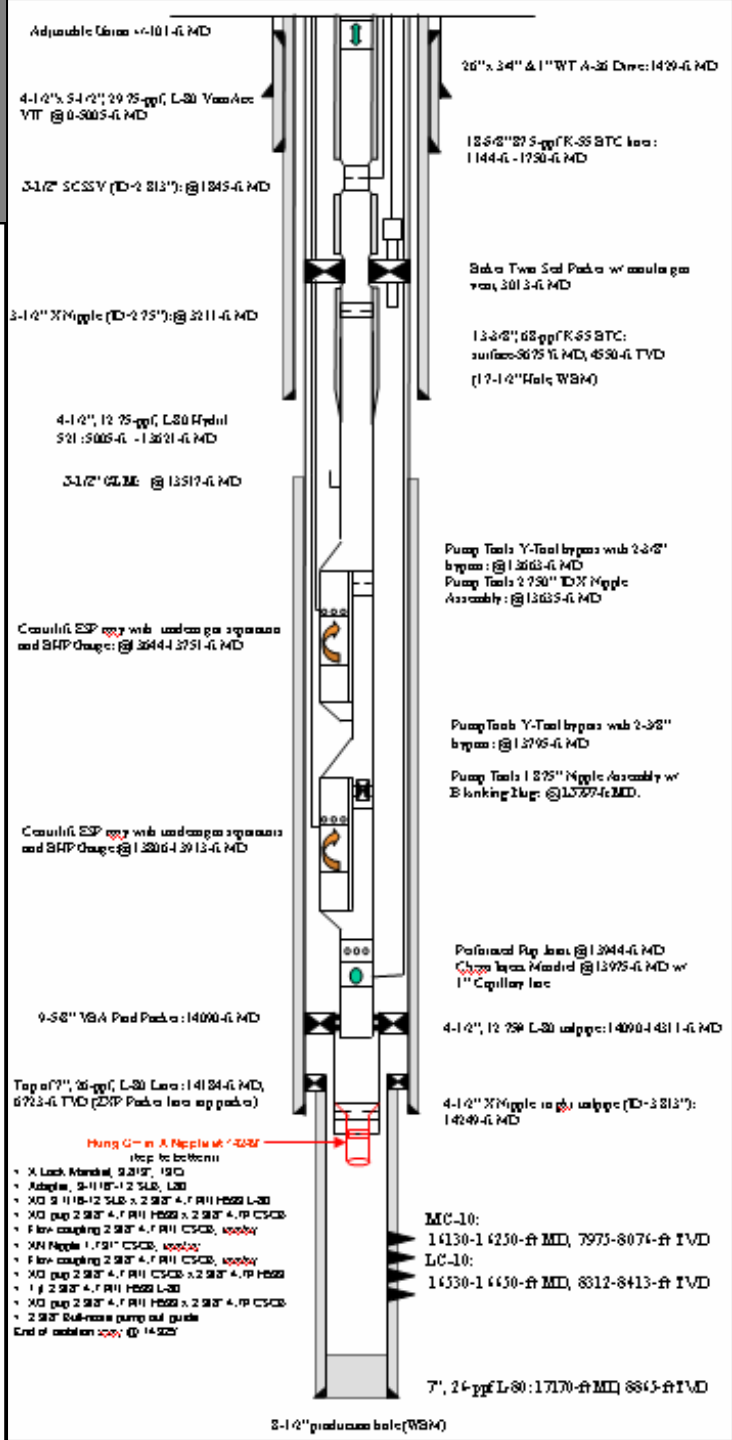
- A discussion of ideal wellbore configurations to optimize future coil tubing interventions will be included based on ExxonMobil experience.

The Problem



Both ESPs have failed and now the shear orifice located in the gas lift mandrel can not be sheared.

Key Question: How do you recover a gas lift valve from 13,517 ft MD at 75º?



Slickline Experience

Conventional

- Attempted recovery of gas lift valves from deviated wells using rollers
  - Work completed in wells with up to 77 deg deviation
  - Normal wellbore configurations (minor ID changes, conventional tubing designs)
  - Cleanout required for waxy fluids (circulation required)

Wireline Tractors

- Completed preliminary testing at near horizontal conditions
  - Limited success but still early in the planning process
- Industry experience exists, but limited data known

Coil Tubing Experience

- Limited internal experience
  - Shallow, semi horizontal wells
    - Used conventional wireline tools connected to the CT string
    - Some successes noted, but minimal number of total attempts made
  - High potential for missed runs if using a kick-over tool (KOT) with a shear pin
  - Noted the loss of “touch” compared to wireline operations
- Limited data noted in industry
  - 1 SPE paper (60722)
  - Limited vendor experience
- Words of Encouragement:
  - It’s like driving a pin with a sledge hammer.
  - It’s like threading a needle with welding gloves.
  - Sounds like you need a box of valves.

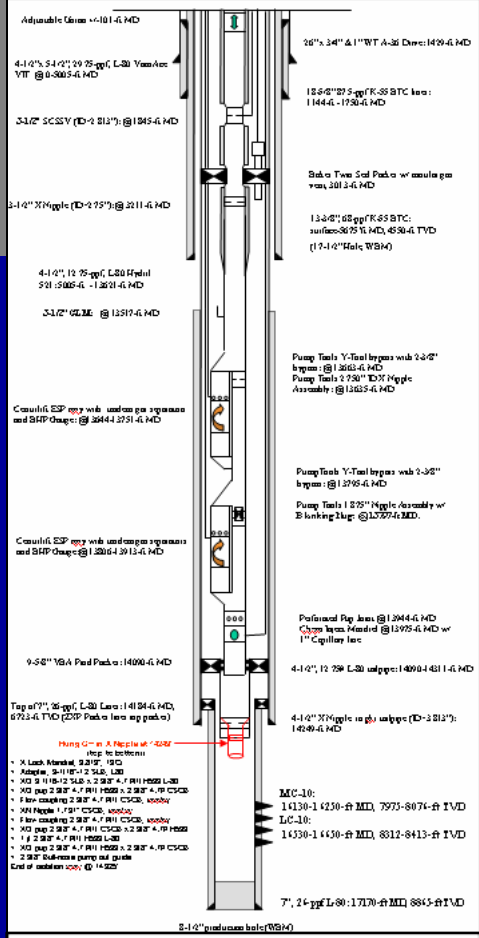
Key – How to proceed?

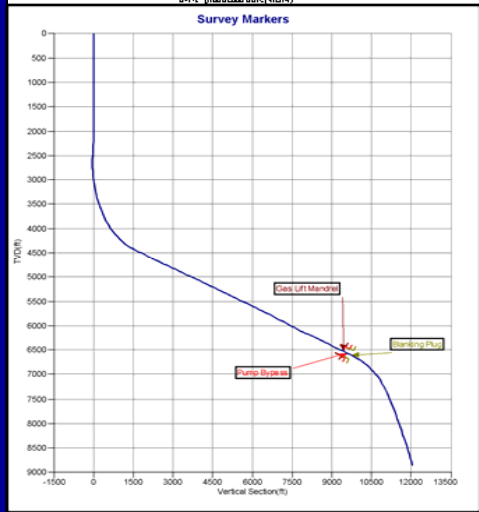
Current Situation:

- Highly deviated well, complex completion, low API oil producer, various restrictions, asphaltenes likely…
- Installed shear orifice will not shear.
- Good producer, need it back!

How do we fix it?

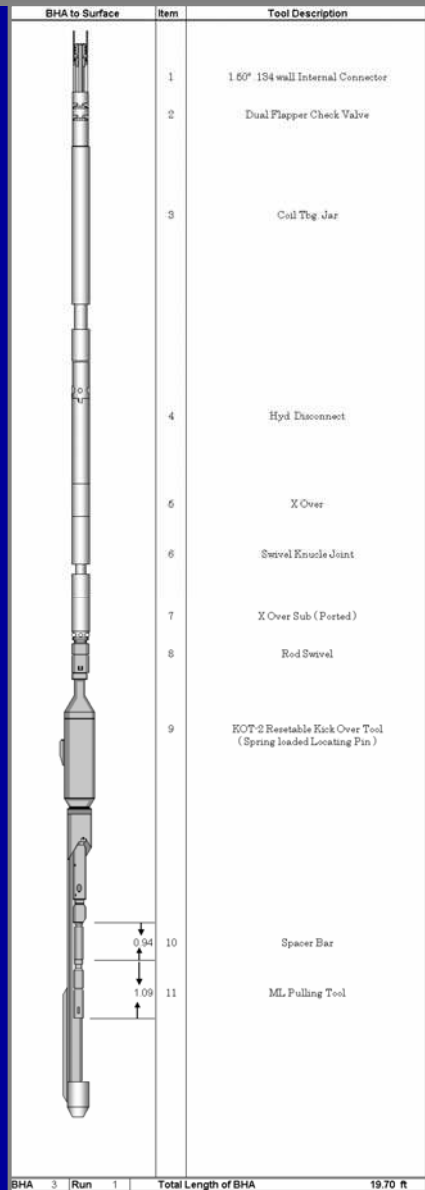
- Shear orifice valve (SOV) must be retrieved from the well and replaced with an orifice, but how do we get there…
  - Conventional Slickline – large sticking risk, high potential for failure, prior success in "waxy" wells had a cleanout before – no cleanout possible by bullheading (check valves and plugs).
  - Slickline Tractors – too unproven, still would need coil to cleanout, how will it handle the varying IDs?
  - Coil Tubing – not much experience, tough to gauge success, but will be needed for the cleanout and to retrieve the blanking plug set in the well.





Preparation for the Job

- Tubing must be cleaned before attempting to retrieve the SOV
- An attempt to remove the blanking plug should be made before attempting to pull the valve
- Must attempt to correct depth
  - Coil tubing will attempt to coil in a wellbore making depth correlation difficult.
  - Can use bypass tubing immediately below the Y tool assembly to correct depths.
- Pulling tool must be resettable downhole
  - Increase the likelihood of success by minimizing the number of trips needed with the coil tubing
- Must be able to securely hold onto the valve once it has been recovered
- Set a “drop dead” date for coil tubing operations
  - Know upfront when to stop if no success is reached

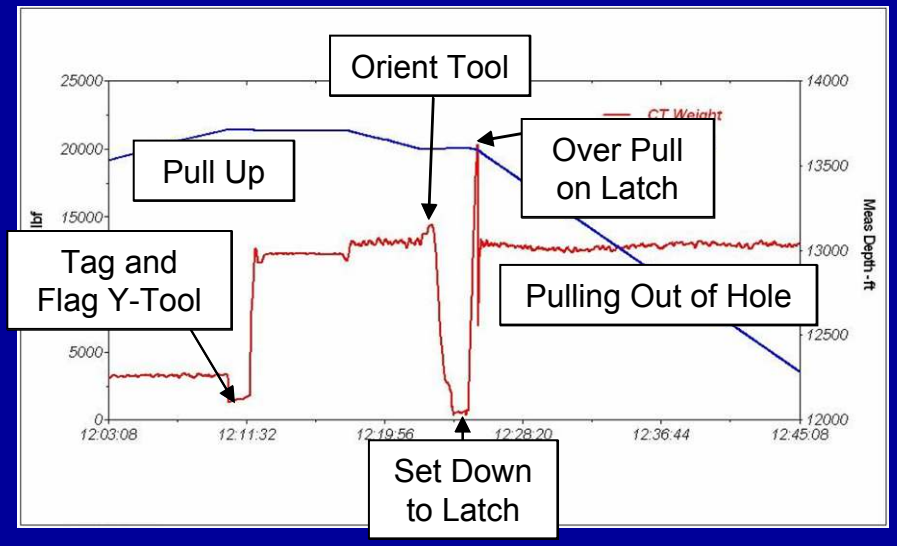


Execution

Before attempting to recover the SOV, the well was cleaned with xylene (extra time spent ensuring the mandrel was clean) and the blanking plug was removed.

Valve Retrieval:

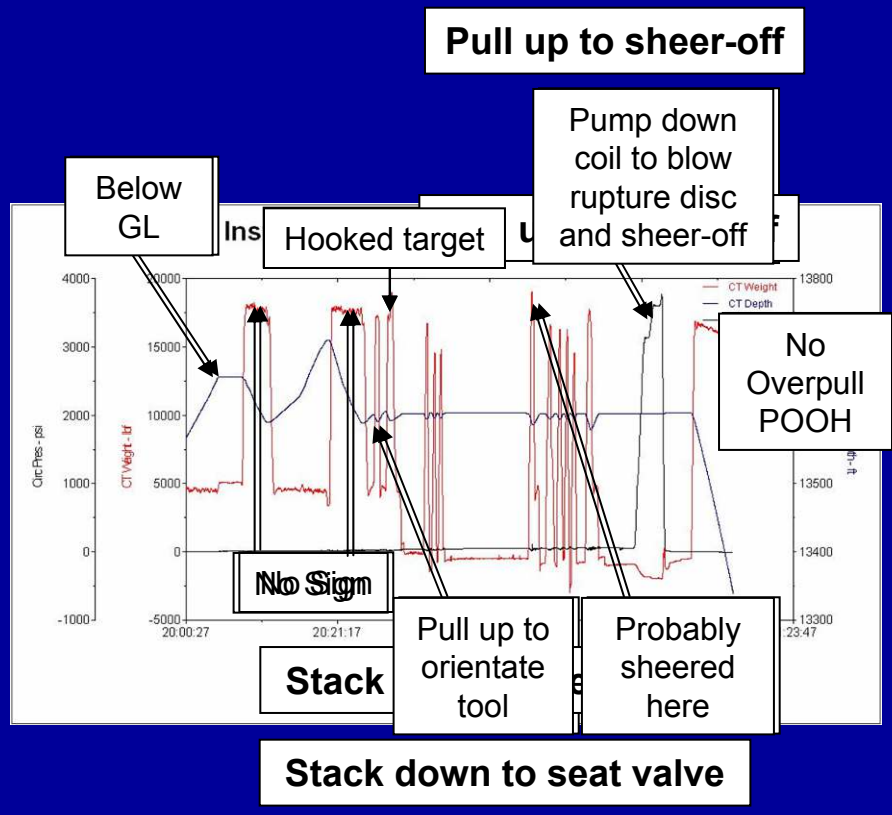
- **Correlate depth by tagging 1.995" ID (expected at 13,640') at 13,703'.**
  - **Coil tubing measurements ~60' off**
- **Calibrated depth and slowly POOH looking for the mandrel**
  - **Mandrel found at 13,592'**
- **RIH to latch onto the valve. POOH with BHA and valve.**



Execution (Cont.)

Valve Installation:

- Attempt to locate the mandrel by passing and then slowly POOH to 13,592'
  - 13,592' was the prior location of the valve based on Coil Tubing measurements
  - Unable to locate valve on first attempt
- RIH and make second attempt to find the mandrel
  - Mandrel found at 13,587'
- Set down to ensure the mandrel has been found
- Pick up on the string to orient the KOT
- Set down on the tool to place the valve in the opening of the pocket.
- Pull-up on the tool to sheer-off
  - Pressured up on to shear the rupture disk
  - Disk ruptured, but jars were not fired
- POOH with BHA assembly
  - Valve not on tool



Designing for Success

- A depth correction point is a must
  - Nipples near the valves are great for this but can be impractical if depending on completion complexity
- E-Coil may be a good option
  - If absolutely no way for depth correction, the availability of real time CCL data will increase the success of the job.
- Clean wells make it easier
  - Best response from the coil tubing string.
- Higher Injection Pressures
  - If less valves are needed, chances of success increase.
- Have a plan…and know when to quit!
  - Know the risk and consequence of each step
  - Identify key milestones and alternate paths upfront
- Know going in that the job will be difficult…
  - if it works smooth, all the better.

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