

Pacific Rubiales Saves Deviated Exploration Well With Thru-Tubing Intervention Technology

Thru-tubing hydraulic pipe cutter allows recovering 4-in cemented drillpipe to perform openhole sidetrack, Colombia

CHALLENGE

Cut a 4-in cemented drillpipe section to recover the openhole section and perform a sidetrack.

SOLUTION

Use thru-tubing (TT) intervention tools—an underreamer and a hydraulic pipe cutter—to mill the cement and cut the drillpipe 100 ft below the casing shoe.

RESULTS

- Milled 1,207 ft [368 m] of the drillpipe ID.
- Underreamed to clean cement cake from pipe ID at anchoring and cutting depths.
- Used the TT hydraulic pipe cutter to cut the 4-in drillpipe below the shoe.
- Recovered 4,446 ft [1,355 m] of drillpipe, allowing the operator to perform a sidetrack and save the well.



Save well with internally cemented drillpipe

After a failed cementing job in one of its exploration wells in Colombia, Pacific Rubiales found that cement had accumulated on the ID of the drillpipe at a depth of 3,305 ft [1,007 m]. However, initial cement displacement calculations indicated that annular cement had reached a depth of 4,665 ft [1,422 m], which was 300 ft [94 m] below the casing shoe.

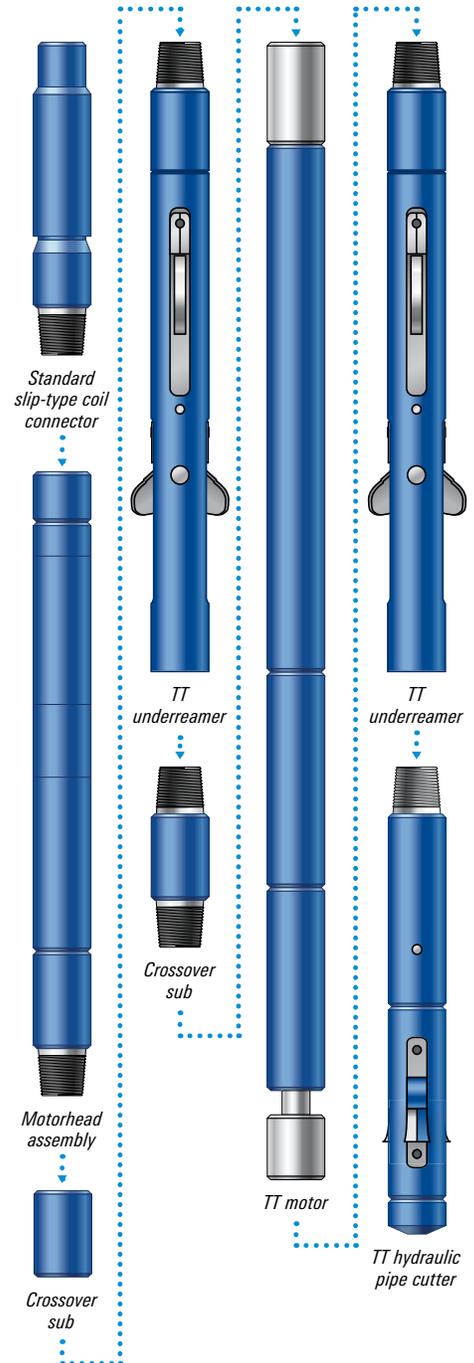
Because of the well's 90° deviation, backoff or cutting operations on wireline were not feasible, and there was no chance of restoring circulation with wireline tools—coiled tubing was the only option. Pacific Rubiales sought a solution to recover the cemented pipe section and successfully perform an openhole sidetrack to save the well.

Use TT milling and TT underreaming tools for effective hole cleaning

Schlumberger recommended running a TT mill, a TT underreamer, and a 2½-in TT motor on 1½-in coiled tubing for effective hole cleaning. For the milling operation, low- and high-rheology pills were also chosen to help recover the cement that accumulated on bottom and to render motor performance.

The TT underreamer selected is designed to pass through borehole restrictions and to hydraulically open to a preset diameter of 3.34 in, the drillpipe body ID. The TT underreamer effectively removes cement, scale, and hard debris from the liner below the production string.

After milling with a 2½-in junk mill, a cake of cement would remain on the pipe wall and anchoring would not be properly performed. An underreaming-only run was completed above the last tool joint to remove the cake using the 2½-in TT underreamer dressed with milling knives that open to 3.30 in. Cement was also cleaned below the tool joint to ease the opening of the cutter knives.



The TT intervention tools milled cement and cut the drillpipe 100 ft below the casing shoe.

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For the pipe to be severed, the TT hydraulic pipe cutter was run along with two TT underreamers for anchoring and centralization. When planning a cutting operation using coiled tubing, it is important to anchor the TT tools to compensate for axial movement of coiled tubing when pumping. This is achieved using a TT underreamer with anchoring blades, which are set on top of the tool joint right above cutting depth. The TT hydraulic pipe cutter improves cutting efficiency to deliver one-trip pipe cutting. A pressure indicator on surface alerts the job supervisor when the knives are fully deployed, signaling that the cut has been completed.

Completed sidetrack and saved the well

Pacific Rubiales milled 1,207 ft of the drillpipe ID. Additionally, the operator used the underreamer to clean cement cake from pipe ID at anchoring and cutting depths. The two underreamed sections around the tool joint were 4,425–4,432 ft, confirming tool joint depth, and 4,438–4,460 ft.

The TT hydraulic pipe cutter successfully severed the 4-in cemented pipe section, enabling the operator to recover 4,446 ft [1,355 m] of drillpipe at surface, perform an openhole sidetrack, and save the well.

| Depth in, ft [m] | Depth out, ft [m] | Time, h | Footage, ft [m] | ROP, ft/h [m/h] |
|------------------|-------------------|---------|-----------------|-----------------|
| 3,258 [993] | 3,305 [1,007] | 5 | 47 [14] | 9.4 [2.9] |
| 3,305 [1,007] | 4,114 [1,254] | 21 | 809 [247] | 38.5 [11.7] |
| 4,114 [1,254] | 4,243 [1,293] | 18 | 129 [39] | 7.2 [2.2] |
| 4,243 [1,293] | 4,388 [1,337] | 34 | 145 [44] | 4.3 [1.3] |
| 4,388 [1,337] | 4,435 [1,352] | 12 | 47 [14] | 3.9 [1.2] |
| 4,435 [1,352] | 4,465 [1,360] | 6 | 30 [9] | 4.7 [1.4] |

A total of 6 runs were completed to clean 1,207-ft of cement from the drillpipe ID. This allowed recovery of the drillpipe at surface, allowing the operation to perform the sidetrack and save the well.



Pacific Rubiales used the TT hydraulic pipe cutter to successfully sever the 4-in drillpipe below the shoe.

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