Boots & Coots Rapidly Intercepts Blowout in Argentina

ACTIVE MAGNETIC RANGING TECHNIQUES PREVAIL OVER PASSIVE APPROACH TO ACCURATELY LOCATE TARGET WELL

NORTHWEST ARGENTINA

CHALLENGES

- Blowout in very remote area
- High-volume discharge of water and carbon dioxide from the crater
- Poor well survey data

SOLUTIONS

- Careful well control preparation
- Detailed dynamic kill analysis
- Expert survey management
- Active magnetic ranging techniques

RESULTS

- Relief well successfully drilled to interception point on first attempt
- Blowout killed ahead of schedule

OVERVIEW

An operator in Argentina suffered a blowout in a remote area 99 miles northeast of Salta. For seven months, the operator had used a competitor's passive magnetic ranging technology and had drilled 11 sidetracks in an attempt to intercept the target well, but with no success. Boots & Coots was called in to drill a relief well. On its first attempt, the Boots & Coots team successfully intercepted and killed the blowout ahead of schedule.

CHALLENGES

The blowout was located in a remote area of northwest Argentina that was two days in travel time from support facilities. Adding to the challenge, high volumes of water and carbon dioxide were discharging from the crater, and the survey data for the target well was extremely poor.

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Figure 1. With the well emitting water and carbon dioxide, a crater is formed around it, thus creating a small lake.

SOLUTIONS

The location of the relief well was cleared some 180 meters (591 feet) from the target wellhead to ensure a safe distance from the discharging water and carbon dioxide. The limited survey data was analyzed by a Halliburton Drilling Engineering Solutions Survey Management team and revised to be as accurate as possible using Interpolated In-Field Referencing to correct the diurnal variations of the magnetic field.

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Figure 2. The wellhead is pulled upright after the well is brought under control and dynamically killed via the relief well.

In Houston, the Boots & Coots engineering team performed a detailed dynamic kill analysis. The plan called for all necessary equipment – frac pumps, kill lines, mud storage, 6,000 barrels of 12-ppg mud and additives – to be staged and ready for the dynamic kill as soon as hydraulic communication with the target well was established. All rig personnel were briefed and prepared for the operation, using a thorough risk analysis.

With a total of 1,465 barrels of kill fluid pumped into the annulus, the blowout ceased and the well was effectively killed.

RESULTS

The relief well was drilled rapidly, guided by the Boots & Coots team, which intercepted the target well on the first attempt. Careful preparation and accurate dynamic kill calculations led to the successful well kill ahead of schedule.

A total of 18 ranging runs were performed from the relief well to the target, the last one showing a separation distance of 0.3 meters (1 foot). Interception and hydraulic communication were established at 2,054 meters (6,739 feet) measured depth, with mud losses as expected. As soon as the relief well went on vacuum, the upper pipe rams were closed and locked with a shut-in choke manifold. Kill operations began by displacing the annulus with 12-ppg kill fluid, followed by a 20-barrel sodium silicate pill, during which the kill rate was increased from 5 bpm to 10 bpm.

With a total of 1,465 barrels of kill fluid pumped into the annulus, the blowout ceased and the well was effectively killed. Post-kill operations included setting a cement retainer and pumping 74 barrels of cement.

The key success factors of the operation were careful planning, expert data analysis, comprehensive risk analysis, detailed dynamic kill analysis, and effective use of active magnetic ranging techniques, all of which differentiate Halliburton from competitors using their limited passive ranging tools.

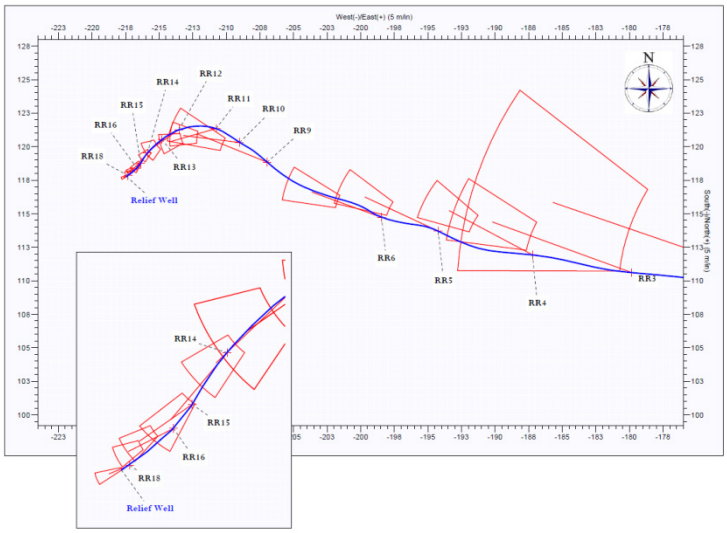

Figure 3. "Call boxes," polygons of uncertainty, are created each time a new ranging survey is taken. As the relief well approaches the target well, the position of the target becomes more clearly defined, and each call box grows smaller until interception.

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