

Asia

Deepest Relief Well in History – Overcoming Salt Formation with Ranging Systems

Wellspot™ Active Magnetic Ranging System combined with precision of Rotary Steerable System overcome challenging conditions

CHALLENGES

- Relief well with fish in HT/HP conditions in remote Asia
- Formation contains multiple salt lenses, some as thick as 700 ft (~213 m)
- Maintain 16 ft (~5 m) separation to ensure pressure control until intercept

SOLUTION

Engineered drilling solution using combination of magnetic ranging services:

- WellSpot™ active magnetic ranging service to reduce positional uncertainty between two wellbores
- Geo-Pilot® rotary steerable system to provide precision for ideal alignment

RESULTS

- Reduced uncertainty and enabled correct path to intercept window
- Accurately aligned well trajectory within operator specifications
- Ranging results not inhibited by salt formation
- Operator safely killed target well from the surface on first attempt

Overview

An operator in remote Asia suffered a kick during a wireline-fishing operation in a natural gas field. The operator was unable to control surface pressure, losing control of the well.

The target wellbore was 21,000 ft (~6500 m) TD with more than 20,000 psi bottomhole pressure (BHP) and 300°F (150°C) BHT. The formation contained multiple thick salt lenses, some as thick as 700 ft (~216 m). Formation integrity was also a concern because of the high pressure. The risk of early hydraulic communication was present due to the proximity of the target well to the relief well.

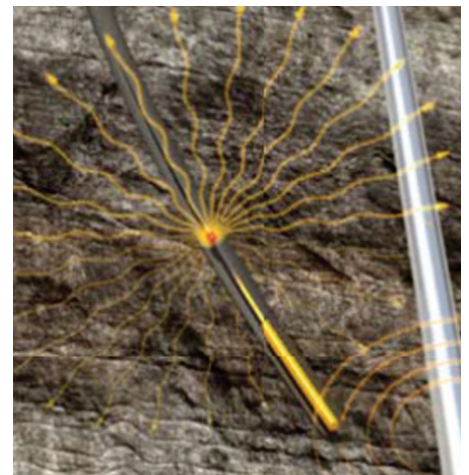
Challenges

To effectively manage pressure during the well-kill process, the relief well had to communicate with the target well at a precise intercept window.

Solution

The WellSpot™ active magnetic ranging system generates a distinct magnetic field on the target well, which is then detected by sensors. By analyzing the signature of the induced magnetic field, an optimal trajectory can be determined.

Active magnetic ranging in salt formations has historically been difficult because of high resistance that insulates the current and prevents it from leaving the well.



WellSpot™ active magnetic ranging system provides a direct measurement between two wellbores

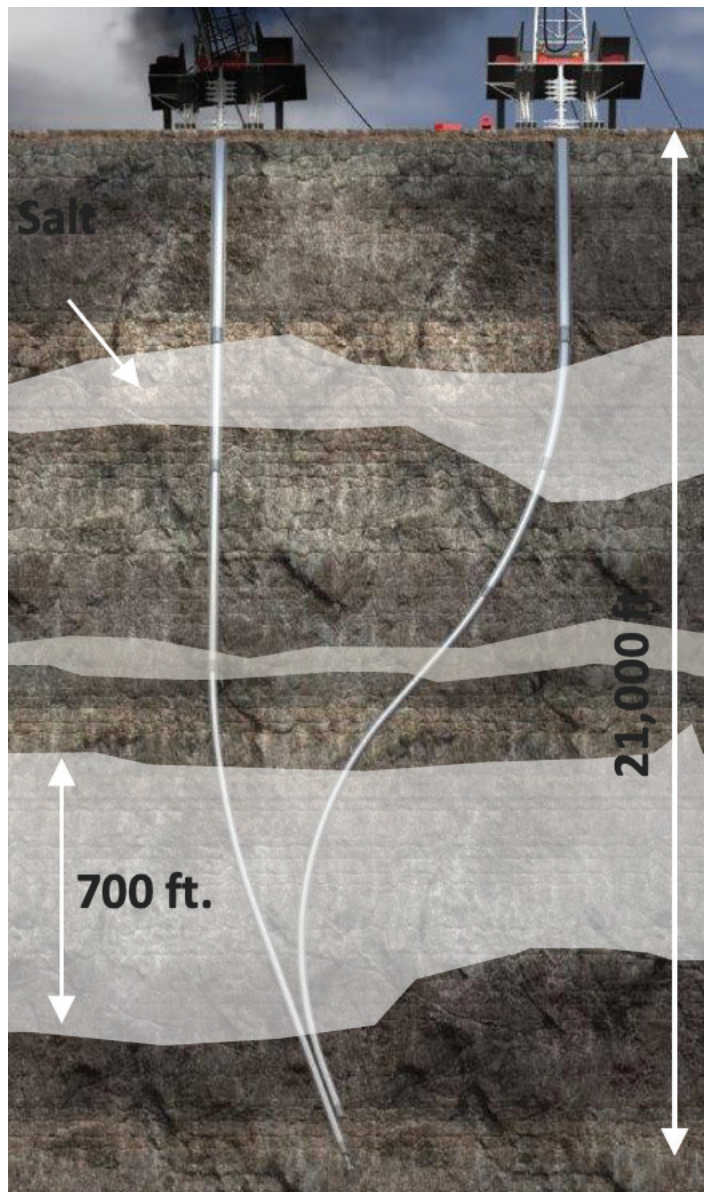
Overcoming challenges with Engineering and careful planning

The interception posed challenges specific to the high-pressure/high-temperature (HP/HT) environment. However, this was carefully managed through precise time management, equipment selection, and ranging run planning. The wellbore contained hundreds of thin salt layers and multiple larger sections (~700-ft thick). Through close collaboration with the onsite geology team, the ranging engineers designed a per-run assembly to mitigate the salt's negative effects. A ranging determination was made during every run using the WellSpot™ active magnetic ranging system. Halliburton deployed the Geo-Pilot® rotary steerable system in line with the intercept well plan, ensuring the team maintained the minimum distance from the target well as required by the operator, thereby preserving wellbore integrity until reaching the intercept window.

WellSpot completes the deepest relief well in history, overcomes salt formation

Results

Working closely with the onsite geology team, relief well engineers planned each run to ensure that problematic salt layers did not affect the results. Through careful planning with the operator, the relief well team overcame challenging wellbore conditions by making precise equipment selections. As a result of these meticulous efforts, the relief well team successfully intercepted the deepest relief well in history on the first attempt.



WellSpot™ active magnetic ranging system intercepted a 21,000-ft target well through multiple layers of salt.

**RELIEF WELL
EXECUTED
PERFECTLY.**



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